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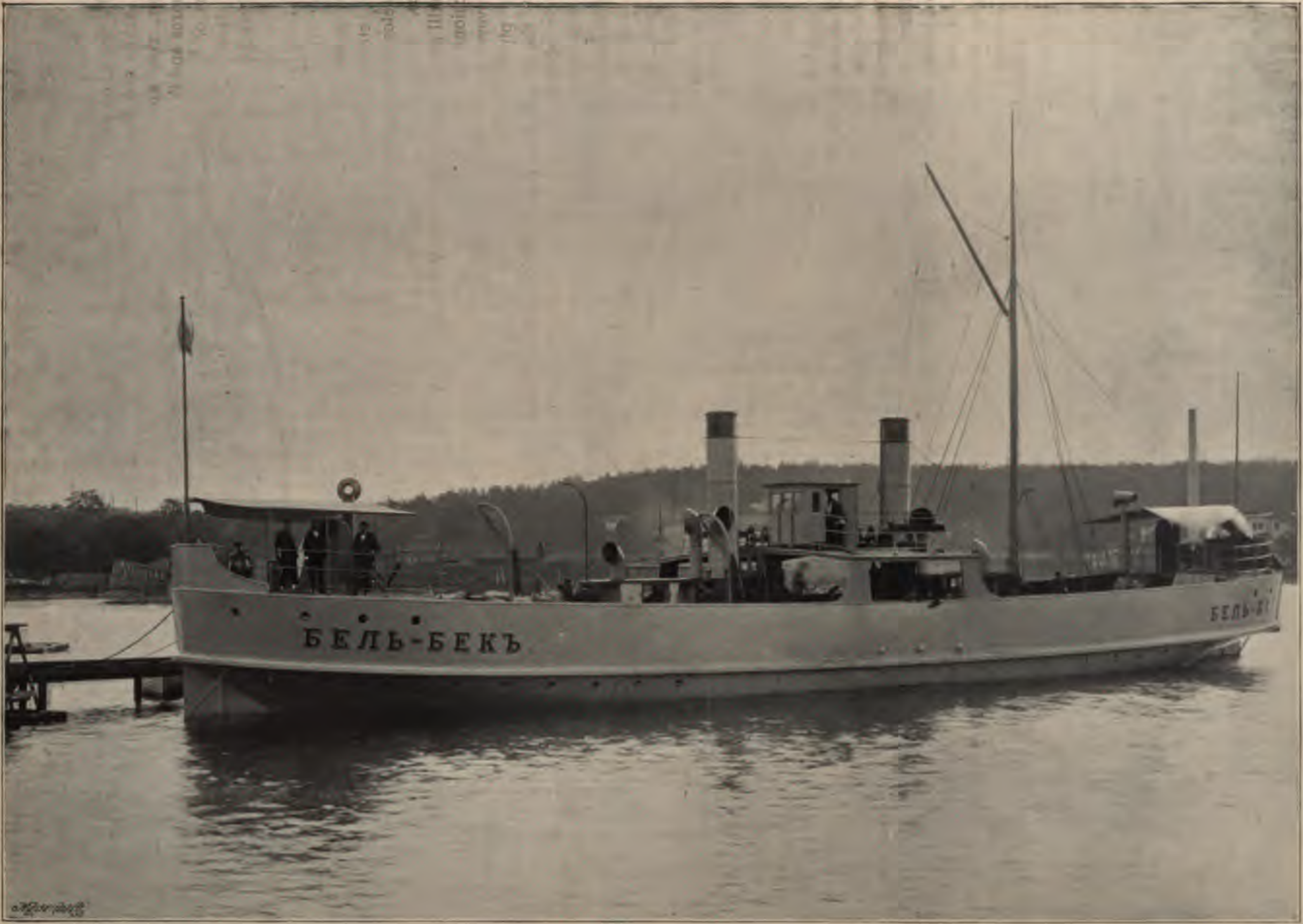


DOUBLE-SCREW FERRY STEAMER "BELL-BROOK," BUILT AND ENGINED BY BERGSUNDS MEK. WERKSTADS AKTIEBOLAG, STOCKHOLM.

The Marine Engineer.

LONDON, APRIL 1, 1898.

THE Report on the working of the Boiler Explosions Act to the Board of Trade has emphasized the danger, now apparently increasing as the steam pressures and the size of boiler steam pipes increase, to the occupants of stokeholes from the bursting of such pipes, and the immediate necessity for all precautions that can be taken to prevent such explosions or to minimize their fatal effects when they occur. We have already ventilated this subject with, we hope, some benefit to our readers as regards the minimising of the effect of such explosions by the stoppage of the heavy rush of steam and scalding water by the action of either quick closing hand valves or automatically closing check valves. There is, however, something derogatory to the skill and ingenuity of marine engineers that such explosions should be so frequent. In the year 1896-97, covered by the report, we find fifteen explosions of steam pipes recorded, including the disastrous explosion of the copper steampipe on board the steamship *Prodano* whereby everyone in the engine room at the time was killed. It appears the pipe had been seven years in use, and failed at a badly brazed seam which opened to the length of 57½ in. The failure was not apparently due to any neglect of observation as the pipe had been examined only some seven or eight days before it burst, and no defect was discovered. The hydraulic test of 320 lbs. per square inch had, however, only been applied at a period seven years prior to the explosion, and the Court therefore found that too long time had been allowed to elapse without again subjecting the pipe to a suitable hydraulic test. It would appear, however, that both cast-iron and copper pipes, whether brazed or electro deposited, failed indiscriminately, and in the case of the steamship *Deemum* the failure was at the flanges of the pipe and was caused by the sudden racing of the engines when the propeller shaft was broken. No hydraulic test, however valuable it may be, would have indicated the tendency to fracture in such case, and there is always the recognised danger that an excessive hydraulic test may tend in itself to set up strains and weakness which may eventually cause fracture at a lower pressure than the original test. Nor is it certain that a steady water pressure would have discovered the probability of the breaking of the brazed joint in the pipe of the *Prodano*, unless the brazing had absolutely deteriorated in use. The finding of the Court was that the flaw was due to original defective brazing of the pipe which had already stood the hydraulic test. Either this conclusion was incorrect, or the brazing had become rotten by the lapse of time and due to alternate heating and cooling, or more probably to vibration for years in the pipes; or else there must have been special causes other than the inherent weakness of the joint to cause the explosion. These are the points, we think, as to which little is known at present. Do the brazed joints of copper piping perish in time and become rotten, either by internal disintegration under electrical action, or the vibration to which all pipes are subject? If so, constant testing at short intervals might discover this. If not, are pipes now made of the best materials and construction to resist the sudden causes of fracture that may arise in a marine engine? On this point we think far too little attention is paid to the best conditions for maximum elasticity in main steam pipes or for expansion joints. Why should not circumferentially corrugated pipes be used, giving enormous longitudinal and lateral elasticity? Again, assuming that the risk to large steam pipes of over 6 in. diameter to burst from unknown causes be admitted, then the area of fracture, which is usually in the form of a split, might be localised and reduced to minimum dimensions by circumferentially supporting the exterior of the pipe by rings placed at short intervals, or by wire binding, fastened at every two or three revolutions without reducing in any way the elasticity of the pipe. Increase in the thickness of the material of the pipe throughout its length would be unwise as increasing rigidity, but wire binding or closely spaced circumferential supports would at any rate localise fractures and retain high elasticity.

An analysis of the shipbuilding returns of 1897 as regards the relative steam and sailing tonnage and as regards the relative requirements of our foreign customers might be interesting. So far as Great Britain is concerned sailing vessels seem to have had their day never to return. It is the practice in general returns of the tonnage built to lump together under sailing vessels barges, lighters and all vessels, even pontoon docks, that do not happen to be propelled by machinery. This swells the percentage to over ten per cent. of the total, and gives somewhat an erroneous impression, as the actual tonnage of effective cargo sailing tonnage is not half of that amount, and thus under five per cent. of the total. France, however, does not seem to follow us in this view of the obselete character of sailing vessels. There were as many as nine sailing vessels built in France of over 2,500 tons, five of which were of 3,500 tons and one of 4,000 tons gross. As regards our foreign customers, Germany is most conspicuous as intending to do without us. She took in 1897 only a little over a quarter of the tonnage she took from us in 1896. The biggest and fastest steamers of the year are German built, and the *Kaiser Wilhelm der Grosse* is evidence of her success in ship construction. She is now copying in Hamburg one of the finest steamers built for her by Messrs. Harland & Wolff. On the other hand, Japan has last year proved the best of our foreign customers, having taken nearly 60,000 tons, which is about double that for 1896. Unfortunately for us, however, she has stipulated for complete working drawings with each ship supplied, and has already proved her skill in copying, and is energetically developing her shipyards and engineering works. Russia has taken in 1897 only about three-fifths of what she took in 1896, but France has in 1897 about doubled her tonnage taken from us in comparison with her requirements of 1896, In the total Great Britain may perhaps be congratulated that in 1897 her percentage of output for foreign and colonial orders has not fallen lower than it did, viz., about 25 per cent. of the total output, comparing with 30 per cent. in 1896, and 20 per cent. in 1895.

The Navy Estimates for 1898-99 were submitted to the House of Commons in a stirring speech by Mr. Goschen, and there is no gainsaying the fact that they represent a very large sum of money. The total Estimate is twenty-three and a half million sterling, and in addition there is a considerable expenditure proposed for naval works. These are indeed, as Mr. Goschen said, colossal sums, and yet the only kind of criticism with which they have been met may be expressed in the words, "Are they sufficient?" No one considers them too much, or if he does his voice is not heard above a whisper. We are indeed living in times when it is obvious to all that if we would protect our interests at home and abroad we must be prepared to strike out manfully with our right arm. And the right arm of the Empire is the Navy. On all sides we note preparations for war. Truly with some of the nations thus buckling on their armour we have no cause for offence, but combustibles abound, and it is impossible to say where the conflagration will end once the spark is struck. The United States and Spain are arming in preparation for possible hostilities: Both nations are buying largely munitions of war, and while our sympathies are largely, if not wholly, with our cousins across the Atlantic, our position is such that every increase in naval armaments must be reckoned with. It is, however, in another direction that we look when we ask ourselves are these Estimates which Mr. Goschen has prepared adequate? We have in the Far East, in Africa, and elsewhere, causes for difference of opinion with France and Russia, and perhaps with Germany. Our trade, our commerce, is threatened, and the Government has plainly declared that rather than see the world's markets closed to us they will go to war. We cannot, therefore, regard with equanimity the enormous augmentation which these Powers have recently made or are preparing to make to their fleets. It is for this reason that Mr. Goschen's Estimates have been submitted to quite an unusual scrutiny, and for this reason also that if anything they are looked upon, in spite of their largeness, as scarcely sufficient.

The Estimates must be considered as divided into three parts, men, ships, and works. So far as regards Mr. Goschen's proposals for increasing the personnel not much fault can be found. He continues that gradual increase of our regular forces which has now been going on as a complement to the increase of ships for several years. Both officers and men take time to make, and in this section of our subject it is particularly noticeable that the engine-room complements have received special attention. Not only is there to be an increase of engineer officers, but that long-felt want, an engineer of warrant rank, is at last to come into existence. We are very glad indeed to note the consideration thus paid to a matter in which the efficiency of the Navy is so deeply involved. As regards the Reserve also there are large additions. And here again it is satisfactory to learn that recent legislation in the direction of affording our reserved engine-room complement opportunities for acquiring much-needed knowledge of the working of ships of war has been successful. But it is not only as regards the regular forces and the Reserve that the personnel of the Navy has come before the public in connection with the Estimates. It will have been generally noticed that quite recently more than one of our great colonies, inspired by the responsibilities of Empire, has made suggestions for contributing to the general protection of Imperial interests. From every point of view it seems desirable and expedient that the Colonies should be encouraged to support the Navy. It is to be hoped, therefore, that some efforts may be made to accept their proposals for forming a reserve of seamen.

Turning to the second section of the subject, our ships, it is to be noted that Mr. Goschen was obliged to explain that, owing to the engineering troubles and to other causes, he had been unable to spend upwards of two millions of the money voted last year on new construction. This is a very painful admission to make. Practically it means that we have been thrown back nearly twelve months, and that the vessels which were to have been pushed forward or commenced last year have been delayed. This retardation of work is due in part to recent changes in the material for armouring our heavier vessels. A new process for manufacturing the plates has proved itself better than the old and the big firms which manufacture armour have had to lay down new plant. They are now again ready to complete orders, but it is at least a matter for regret that in the programme for this year Mr. Goschen has not seen his way to entirely make up for lost time. Virtually we are to do in the twelve months ahead of us the work that was delayed last year, and such new ships as are proposed will not, unless some change is made, be begun before April, 1899. It is extraordinary and unintelligible why with our enormous resources we should be unable to make progress with greater celerity. In this connection it is noteworthy that some six or eight firms have tendered for the construction of the four belted cruisers of last year's programme, vessels for which the contracts have just been given out. Why, it may be asked, should not this number be doubled when in so many establishments there must exist facilities for constructing them? With shipbuilders and armour-plate manufacturers asking for work, it would surely be wise not to delay any longer the commencement of vessels which it is already intended to put in hand, although, according to present arrangements, at a later date. There remains the works which include such important and essential matters as the docks at Gibraltar, Hong Kong, and elsewhere. Here again the First Lord had to acknowledge that he had been unable to spend a sum of nearly two and a half millions sterling which had been placed in his hands for that purpose. Excuses there are, it is true, but of real explanation none that are satisfying. In the circumstances it is astonishing that there should be the continued confidence in the Board of Admiralty, and yet it must be admitted that this is the case. The temper of the public is a tricky thing, and although just at present the proposals of the Admiralty, as embodied in the Estimates, have been accepted, it needs no great amount of prescience to see that unless greater efforts are made in the direction of making up for lost time, there will come about a change of opinion, the effects of which none can foretell.

The Duties of Shipmasters.—We understand that a very useful little book written by Dr. B. W. Ginsburg, one of our valued contributors, will shortly be published by Messrs. Charles Griffin & Co., as one of the "Nautical Series." This book is not intended we believe to be a law treatise of the subject but rather aims at the instruction of shipmasters in the various duties required by the statutes relating to the subject. To this end various regulations, rules and orders are appended to the book, and the principles are expounded upon which the law in relation to shipping matters is founded, so as to give shipmasters some idea as to what course to adopt in dealing with unexpected crises. At the same time the book is not intended in any way as an attempt to make every shipmaster his own lawyer.

RANKINE'S PATENT MARINE FILTERS.

THE question of multiple or stage filtration has received a considerable amount of attention from Mr. David A. Rankine, of 11, Oriel Chambers, Water Street, Liverpool. We have pleasure in presenting to our readers the description and illustrations of three new types of filter which Mr. Rankine has placed on the market.

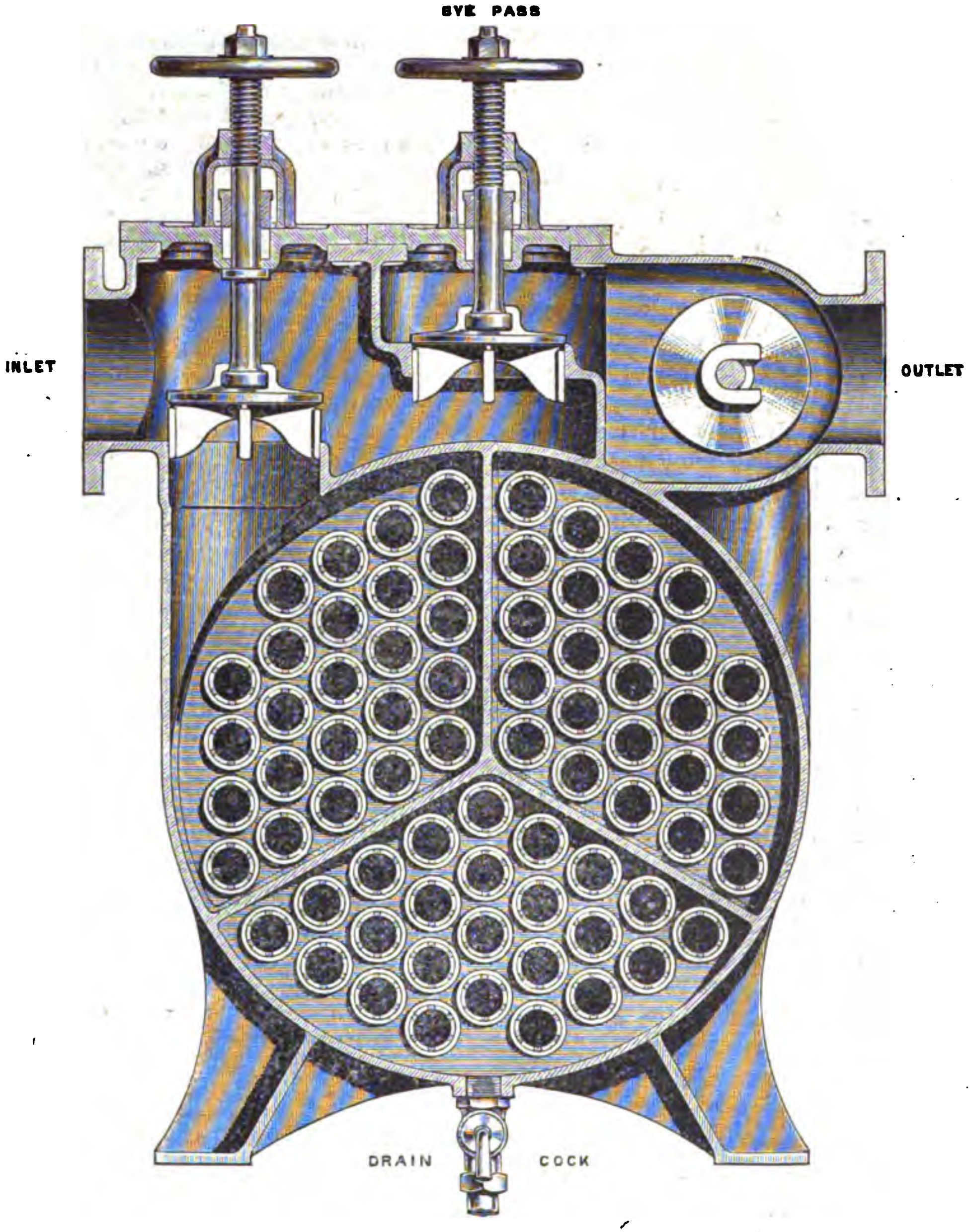
The filter illustrated in Fig. 1 effects triple filtration, and has been designed specially to meet the requirements of the British Admiralty for battleships and cruisers, and filters have been fitted to ships of these classes. The main object to be attained in these filters is the filtration of the feed water three times in succession, so as to secure a high standard of purity.

As will be seen from the diagram Fig. 1, the construction of the filter consists of a cylindrical casing, divided into three distinct filtering chambers, A, B and C, an open passage being provided at the back end, between the chambers A and B, and between the chambers B and C in the front end, also a passage at the back end of the chamber C, communicating with the outlet valve. The filter is fitted with a valve chest, cast on, or fitted to, the main structure, containing the inlet, with bye-pass, and outlet valves; the filter is also fitted with a drain cock, a blow-through valve for cleaning purposes, and an air cock and pressure gauge.

The filtering arrangement consists of three series of filtering cartridges of equal filtering area, each series being interchangeable, as is also each cartridge, so that each entire series, or each separate cartridge can be removed without disturbing the others. The system of filtration is as follows:—The feed water enters through the inlet valve into the chamber A, filling the chamber and surrounding the cartridges in this section, it then passes through the filtering medium to the centre of the cartridge, and onward to the back passage leading to the chamber B, and so on through the cartridges in the chambers B and C to the outlet valve. The feed-water thus passes through three distinct filtering systems of equal area and surface, thus ensuring an equal flow and distribution of pressure being maintained from start to finish throughout the entire filter.

In Fig. 2 we show a type of filter which has been specially designed for general marine purposes, the object being to effect double filtration. In this case the casing is divided into two compartments, the water passing from one to the other. It is fitted with a valve chest with the three valves as before mentioned but in this case, the outlet and bye-pass valves are on one spindle, so that when the outlet valve is shut on the filter, it is open on the bye-pass, and *vice versa*. A relief valve is also fitted, to meet the requirements of the Board of Trade. The fittings upon, and functions of the device, are similar to those already described.

In Fig. 3 we show another type of filter, on what is termed the compound principle, which has been designed to meet the great difficulty of dealing with very thin qualities of cylinder oil in the feed-water. It has been found that, when treating water containing oils of this description, a considerable quantity of oil passes the first stratum, no matter what the body of the material may be, and double filtration has been found to be absolutely necessary. It is also stated that experience has proved that a series of strata and alternate plates does not extract the oil, which is only taken up by the first plate, a considerable quantity passing entirely through the others.



TRIPLE FILTRATION

Fig. 1.

It has been further found that filtering through two concentric cylinders was ineffective, as in this case the area of the inner cylinder was stated to set up a resistance that not only destroyed the natural flow of the water, but overloaded the feed-pump.

The inventor therefore considered that the most efficient method of extracting the oil by double filtration was to first filter through one stratum, then divide or distribute the feed-water again over as great or a greater surface than the first, the object being to split up and divide the flow of water, and at the same time, by the increase in area, to prevent an undue resistance being set up on the first stratum and feed-pumps. It has been shown by experience, it is contended, that if this principle is adhered to, the second filtration will take up as much oil as the first, and thus remove the main portion of it from the feed-water.

As will be seen by the illustration, the casing and valves are similar to those already described, but the filtering devices are somewhat different. The arrangement consists of an outer cylindrical cartridge having flanges at each end, to take the walls of the filtering chamber. This is covered with two or three turns of filtering material as may be required, and forms the first filtration system. Into this cartridge is telescoped a frame, with a series of seven smaller cartridges similar to those already described, covered with filtering material of double thickness, which is drawn on with cartridge like a stocking. This forms the second filtering system. The entire filtering arrangement fits close up to a flange at the outlet end of the casing, and is held in position by the door or cover. The path of the water and operation of filter can be readily seen from the diagram.

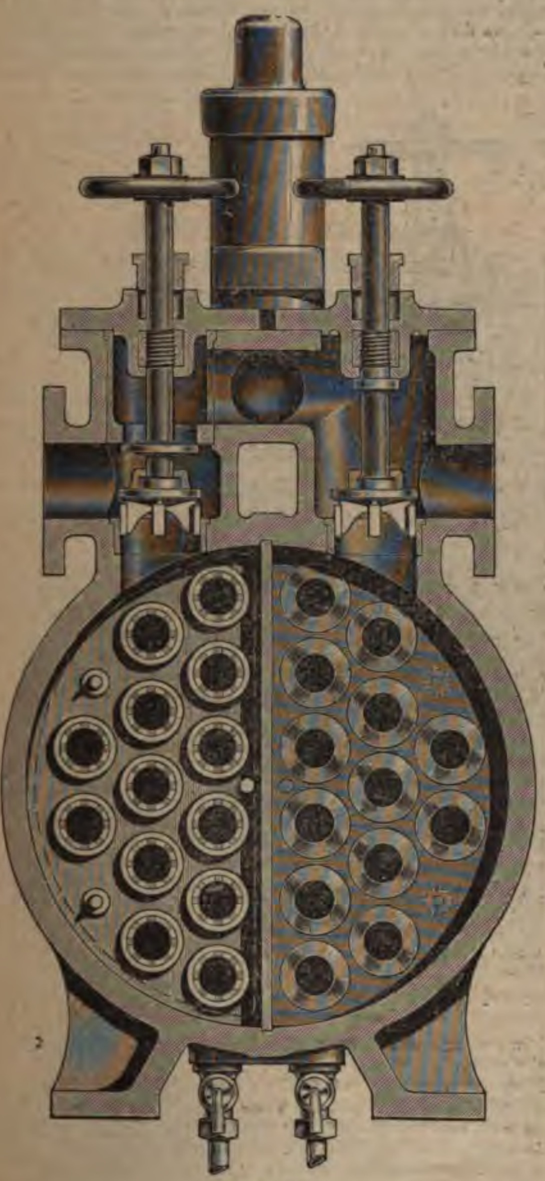


FIG. 2.

We understand that these filters have been fitted in plants where large quantities of oil are used, and have given every satisfaction.

THE FLEETS OF THE MAIL LINES

From our own Correspondent.)

Liverpool Dock Improvements.

It is interesting to see that in the great improvements which are contemplated at Liverpool the æsthetic side of the question is by no means lost sight of. We can hardly expect the Mersey Docks and Harbour Board to devote its time to the beautification of the docks, though they do certainly, and very properly, make their works as handsome in their plain solidity as such things can be. But the Corporation of such a city as Liverpool has duties in the direction I indicate, and it seems not inclined to neglect them. An arrangement has been come to between the Dock Board and the City Council whereby the old George's Dock —which dates from the year 1769—is to be purchased by the Council for public improvements. This arrangement, of course, will need parliamentary sanction. But it is not likely that much difficulty will be found in getting that. Then, the plan is to fill up the old dock—which nowadays is of very little account—and improve the approaches to the landing stage. I suppose the old Goree Piazza will come down and a line of fine buildings be exposed to a great open *place*. At all events, the improvement of the three business streets (Water Street, Brunswick Street, and James Street)—already commenced by many fine buildings such as the new White Star office, the new buildings of the Bank of Liverpool, and the great house which contains the offices of Messrs. Elder, Dempster & Co., and Messrs. C. W. Kellock & Co.,—will be given a very great fillip and encouragement. Liverpool will soon be enabled to make her appearance to the first glimpse of the traveller from the west of a character unequalled and even unapproached elsewhere.

The Allan Line.

The news of the month, from our point of view, is surely the announcement that the Allan Line are at last about to build important steamers of the mail-carrying class. It is 16 years since the *Parisian*, still their crack steamer, came to them from the yard of Messrs. R. Napier & Sons, of Glasgow. Since that time I could give the names of a quarter of a hundred steamships that have been added to their fleets; but half of these have been acquired by purchase from moribund Atlantic companies and others, and they can hardly count as additions to the mail fleet, whilst many of the others have been intended for other of the Company's numerous services than that running to the St. Lawrence with the mails. Nor do I forget the *Numidian* and *Mongolian* added from Messrs. D. & W. Henderson's yard in 1891. These, though fine boats enough, can hardly claim mail rank.

But now we are informed that three vessels are in contemplation. The first of these will be the *Castilian*, whose keel is already said to be laid. She is to be built at Belfast by Messrs. Workman, Clark & Co. Then will come the *Bavarian*, to be built by Messrs. Denny & Co. of Dumbarton; and thirdly, the *Tunisian*, from the yard of Messrs. A. Stephens & Co., of Linthouse, Glasgow. Each of these vessels will be of about 8,000 gross register, 9,000 tons deadweight capacity, and 16 knots speed. They will all have large insulation for meat carrying, and will accommodate about 1,100 passengers each. Of these 150 will be accommodated in the saloon; 120, in the intermediate cabin; and, 800 in the steerage. It is not yet announced whether the twin-screw principle will be adopted or not. One would imagine, however, that for the St. Lawrence, of all places, the necessity of duplication would be apparent enough. This announcement leads me to the conclusion that the

Petersen, Tate & Co. Combination

are not likely to bring into being the 20-knot service which has been so long talked of. For if they were likely so to do, Messrs. Allan, after the many years in which they have had the lion's share of the St. Lawrence passenger business, would be distinctly, and without attempt to avoid it, accepting defeat in a way that no one who knows them would believe for a moment. If (as the new aspirants for the trade proudly stated some—perhaps I should now say many—months ago) the new steamers for the Petersen-Tate line are to be "equal in every respect to the *Lucania* and *Campania*," they will absorb all the cream of the traffic, and Messrs. Allan's new boats will have to content themselves with such traffic as the White Star *Cymric*, from Liverpool and the Atlantic Transport Company's steamers from London are catering for in the New York trade. I can hardly believe that that is what the *Castilian* and her sisters are designed for, and, accordingly, one is driven to the conclusion that the Messrs. Allan—who have, doubtless, excellent sources of information open to them—are satisfied that the four "*Lucania's*" will never come into being at all. The general opinion, as voiced by newspaper paragraphs at least, is not in this direction, however. For it is stated that Messrs. Petersen, Tate & Co.'s representative (Mr. Rowell) has already arrived in Ottawa with a model of the steamships which are to fulfil the contract. This model shows a steamship of the "turret-deck" type. And it is added that already a contract has been entered into with Messrs. Hawthorn, Leslie & Co, of Newcastle, for the construction of these vessels. I am, however, unfortunately, unable to tell my readers either when the first of these ships is to be delivered, or how far Messrs. Hawthorn, Leslie & Co. have progressed with their construction. Next month perhaps something definite will have transpired.

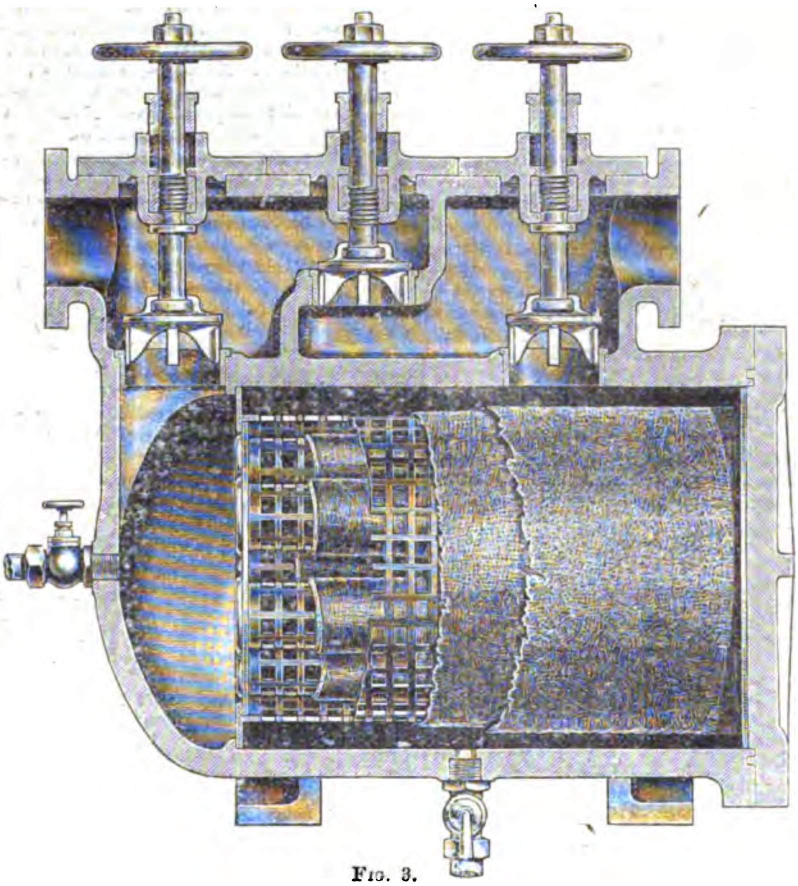


Fig. 3.

Rankine's Patent Marine Filters. (*See page* 3.

The National Steamship Company's

annual meeting seems to have attracted some little attention, and perhaps some heartburning. The shareholders (headed by a member of Parliament, who was not present, but who addressed a letter to the chairman for delivery to the assembly) criticised the action of the directors because the latter have added a fourth steamer to the fleet of the line. It will be remembered that when liquidation or absorption became inevitable to the old National Company, other offers were refused, and the management of the concern was confided to Messrs. Williams, Torrey & Feild, who had bought a preponderating amount of the company's stock, both ordinary and preference. These gentlemen have shown their knowledge of the Atlantic trade in their management of the Atlantic Transport Company. Some of their people, in conjunction with representatives of the independent shareholders, went on to the board of the National, and their firm became its managers. They quickly got rid of the six ships, which were so antiquated as to be merely a millstone round the company's neck, and went on trading with the remaining two vessels, *America* and *Europe*, fairly modern cargo boats. They then found—and no one acquainted with commercial conditions would be surprised at the fact—that two swallows do not make a summer—I mean that two steamers do not make a line. For shippers, if their connection is to be retained and extended, want frequent opportunities of despatch, and two steamers can only afford about a sailing once in three weeks between London and New York.

Those at the head of the concern were certainly not at all precipitate in their action. They were content with cutting down and observing the lie of the land during the first year of their work. During the second they bought one steamer, and her working was so successful that they felt it desirable to buy another and sister vessel on the same terms and in the same way. And it is this purchasing that has caused the trouble. To pay for these additions some ninety thousand pounds of debentures has now been placed ahead of the shareholders' property, and they feel that it is very unlikely that they will ever see a dividend. In that their chairman agrees with them. At least he thinks only the youngest amongst them may. And herein is the directors' justification. It seems now abundantly proved that the shareholders could never possibly have obtained anything if the purchases had not been made. There is now a faint possibility that some day one may be earned. So if they do not get dividends they may at all events hope to see the value of their stock steadily, if slowly, rise. This is something if not much. But a further point in the criticism of the directors may not be lost sight of. The two ships bought were taken from the fleet of the Atlantic Transport Company, which is also managed by Messrs. Williams, Torrey & Feild, and the propriety of this action is questioned. There seems to be some ground—on the face of matters—for the criticism. But it must be remembered that this is not quite an ordinary arrangement. The managers are also the largest shareholders here. They stated that they held two-thirds of the preference stock, and between four, and five-sevenths of the ordinary shares. They also state that they are bent on increasing their holdings. Their stake is consequently so large that they are obviously very much concerned to act for the immediate benefit of the shareholders. It would appear, therefore, that the criticisms upon their action are hardly justified. But the miserable ebb to which the old National Company fell throws a very lurid light on the difficulty of maintaining a position in the Atlantic trade. The shareholders of that company saw their stock, which cost them ten pounds, go down to half-a-crown, and their employés were scattered to seek new occupations. Shipbuilders, too, are likely, for long enough to come, to find that no orders are forthcoming from this direction.

The White Star Company's

old offices were not long unoccupied. They have been taken by Messrs. Cayzer, Irvine & Co., the managers of the Clan Line of steamships. This is, of course, a very large and important company, owning, as it does, somewhere about 120,000 tons of shipping. In points of numbers of vessels under its flag it eclipses the White Star Company itself. But the average tonnage of a Clan liner is less than half as much as the mean size of the vessels of the great Atlantic line, and so the aggregate tonnage of the old tenants is nothing like reached.

The White Star Company's steam barge *Traffic*—the only wooden vessel which the fleet ever contained—is announced as for sale. She is an unimportant little craft, built some twenty-five years ago up the higher reaches of the Mersey. Her length is but 100 ft., and her loaded speed six knots.

The *Cymric* did well on her maiden voyage. Her outward passage was equal to about ten and a half days from Queenstown. She was not, of course, pressed. But homewards she was under nine and a half days from New York to Liverpool. She will undoubtedly do better still when she is let out. Her cargo was a wonderful mass of merchandise. It amounted altogether to 16,000 tons measurement, and comprised, according to the *Shipping Gazette*, 100,690 bushels of grain, 1,700 sacks of flour, 11,288 packages of timber, 5,272 barrels of sugar, oil, &c., 13,413 bales of cotton, 475 tierces of provisions, 3,359 bars, &c., of steel, 500 casks of copper, 8,095 pigs of lead, 115,265 packages of slate, 4,779 quarters of fresh beef, 579 pigs' carcases, as well as a living freight of 200 horses, 700 cattle, and 1,002 sheep.

Old Steamers.

The last act has been reached in the history of one of the oldest and most celebrated steamships now afloat. For it is announced that on the 16th March, the Telegraph Construction and Maintenance Company disposed of their steamship *Calabria* to Dutch buyers. The purchasers may be assumed to be shipbreakers, for the *Calabria* is no less than forty-one years old. She hailed from a good yard, however—that of Clydebank, where Messrs. J. & G. Thomson constructed her in 1857 for the Australian trade. She was one of the crack ships of the time when she came out under her original name of *Australasian*, and, indeed, was so much in advance of the requirements of the day, in that direction at least, that it was not very long before she was transferred to the Atlantic service and to the Cunard flag. She was a big ship, too, for that period, being 360 ft. long over all. Her gross tonnage was 2,751, and her passenger accommodation was very good, the height between her decks being then much noticed. Her maximun speed on her trial at Stokes Bay, under Admiralty conditions, before she was accepted for the Australian mail contract, was over 14½ knots when loaded down to a 21 ft. draught. She was then propelled by a pair of direct acting engines of the simple expansion type. In the early sixties she was concerned as a Government transport in the famous and fruitless attempt to force the St. Lawrence against the early frosts of winter. At that time she was under the command of Captain Theodore Cook, who continued in the Cunard service long enough to command so modern a ship as the *Umbria*. In 1869 she was practically rebuilt by Cunard's, who continued her in their Boston service for another seven years, and then sold her to the Telegraph Construction and Maintenance Company. The new owners gave her still another set of engines after a year or two, and, of course, fitted her up for their special work of cable laying and repairing. I have some sort of idea—but I quote now from memory merely, and not from my notes—that she has been employed also as a distilling ship in connection with certain military operations.

One of her original characteristics may be noticed. When she came out she was ship-rigged and had two funnels, which latter arrangement was by no means common in screw ships at that date.

Another very old ship has changed owners. This is the *Takasago Maru*, which the Nippon Yusha Kaisha has just sold for the rush to Klondike. She was launched as a paddle steamer by the Thames Iron Shipbuilding Company in July, 1859. She was then known as the *Delta*, and was designed for great speed. At the time she was constructed the P. & O. Company had already in a general way found out the superiority of the screw, and had practically discarded the paddle. But the *Delta* being intended for special work in the Mediterranean with the Indian mails was so fitted out as a paddler because it was still doubted if the required speed could be reached with the screw. She was about 325 ft. long and 35¼ ft. broad, her gross tonnage being 1,618. Oscillating engines of considerable power were fitted to her by John Penn, and her boilers carried a pressure of 20 lbs. of steam, which was somewhat in excess of that of her compeers in the fleet. The paddle engines have long since been replaced by compounds driving a screw, and for very nearly a quarter of a century she has flown the Japanese flag. It is but the other day that a very valued correspondent in the North of England sent me from Japan a copy of a snap photograph which he had taken of her in Yokohama harbour, a little time previously. It seems to lend some additional interest to the mention of this old vessel to remember the fact that the present new departure of her first owners in building the special and long-delayed *Isis* and *Osiris* is really little but a reversion to the practice which prevailed forty years ago, when their predecessors in the directorate built such vessels as the *Delta* for work in the same waters.

The Union Line

has apparently determined not to be satisfied with its present position, which enables it to make all its intermediate sailings with the successful "G's," and which allows it to make about half its mail sailings with twin-screw vessels. The announcement is made that "several vessels are contemplated." Indications as to two of these are afforded. One will be another mail boat of the *Briton* class, and the keel of this ship is stated to be already laid. Another is to be a further improved "G." One can understand the reason for both of these. For with the development of East African ports there may easily spring up opportunities for advantageously prolonging the round voyage of the cargo boats, and the motto of the present Union Board seems to be, "Keep well in advance of the requirements of the day." In regard to the mail service it would, of course, appear plain enough that their aim is to get their whole work carried on by vessels of the *Briton* and *Scot* classes, and they will no doubt go on adding new mail boats as quickly as financial considerations will allow. But the undertaking seems a very vast one—it is the practical replacement of a large fleet with the most expensive type of ship known. It is being built as fast as good building can be done, and one may be excused for asking if one wonders how it is done. I might, perhaps, add that the contemplated vessels are to be built by Messrs. Harland & Wolff, of Belfast, who have already done so much for the modernisation of the line.

La Compagnie Transatlantique

have just re-boilered their mail steamer *La Bourgoyne*, and altered her engines. She had a very satisfactory trial after her refit, attaining a speed of something well over 18 knots. She has now rejoined the service, and on her first departure—which was on the 19th March—she took out a consignment of a hundred carrier pigeons in order to commence the first of a series of what may prove to be very interesting and important experiments as to the possibilities of, by these means, effecting communication between a steamship at sea and the neighbouring coasts or passing ships. The pigeons taken by *La Bourgoyne* were to be released at a distance of about 50 miles out from Havre. The mail steamer of the following week was to take a similar number for release at a greater distance from home. I have not yet heard the result of these experiments, but it is understood that if the results justify the doing so, the company will establish pigeon-lofts at New York as well as at Havre, and arrange for the steamships to carry birds so as to secure communication with land in case of breakdown.

Last month I had to chronicle the loss of the Compagnie Transatlantique's steamer *Flachet*. This month I regret to have to mention the stranding of another vessel from their fleet, though it is pleasant to be able to add that on this occasion there was no loss of life. The *Ville de Rome* is the most recent loss. She was a single screw vessel of about seventeen years of age. Built at Glasgow by Messrs. A. & J. Inglis, she was fitted with compound engines by her builders. Her gross tonnage was 1870, and she was some 330 ft. long. She was employed in the company's Mediterranean trade.

The Dangers of Single-Screw Vessels.

There are no less than three stories to be detailed this month, of how Atlantic passenger vessels have been delayed by the breaking of shafts. The first was the case of the Compagnie Generale Transatlantique's *La Champagne* which broke her tail shaft in the stern tube, when crossing the banks of Newfoundland on a westward voyage with the French mails, and upwards of three hundred passengers. The accident occurred on the 17th of February. The damage was irreparable at sea, so the captain anchored in 40 fathoms, and waited for assistance. As he lay signalling, a large passenger steamer came along and ignored his calls for aid. This was five days after the accident when both cables had parted, and the disabled vessel had begun to drift towards the southward. Fortunately before the passengers had recovered from the depression caused by this very disgraceful conduct of those in charge of the unknown vessel, the Liverpool steamer *Roman* came up, and succeeded in towing *La Champagne* into Halifax, a distance of 800 miles. There will, it is to be supposed, be a very heavy salvage award to be met in this case. Then there is the long delay to passengers, mails, and cargo, and the great anxiety which the vessel's non-appearance caused. One cannot fail to have great sympathy with the Compagnie in its rapid run of misfortunes during the last year.

The commander of *La Champagne* was, of course, in a very difficult position, and it would be ill to judge his conduct too strictly. But he seems to have committed a serious error in judgment after the accident. He called for volunteers, and sent ten men away in a boat for assistance. These ten were fortunately picked up by the steamship *Rotterdam*, and carried into New York. But they suffered terrible hardships for six days in an open boat; as might have been expected, considering the time of year in which the adventure was undertaken. And these sufferings were so unnecessary. *La Champagne* was amply provisioned, and was not out of the steamer track. She was much more likely to attract assistance than the tiny boat which lay but a speck on the ocean, and which would, at times, be altogether invisible in the trough of the sea. The chances against the adventure were very many, and it is a merciful thing for all concerned that the *Rotterdam* brought the gallant ten safely into New York. I do hope that, without in any way punishing the captain for doing what he thought best in a difficult crisis, some such notice of the affair will be taken as will make a warning to masters not to send men away to probable death on such unnecessary expeditions.

The next case is that of the *Catalonia*. She was bound to Boston, when on the 2nd of March she broke her crankshaft, and was thereby disabled. The s.s. *Delaware*, of Liverpool, picked her up in lat. 43.3 deg. N., long. 52·35 W., and she also was taken to Halifax, where she arrived on the 7th. Here again was considerable delay—for the *Catalonia* was fifteen days between Queenstown and Halifax—and probably a heavy salvage claim will be made. But the circumstances are in every way less serious than those in the story of *La Champagne*.

The third case is that of the *Paris*. It is a very different tale indeed, because the *Paris* is a very different type of ship. She was eastward bound when, on the day after leaving New York, her starboard shaft broke in the casing, 50 ft. from the boss of the screw. Here, of course, it was impossible to get at the injury, as the *Paris* is one of the earliest type of twin-screw vessels, and has great lengths of shafting carried outboard in the Naval manner. The vessel was but 375 miles from New York at this time, and could therefore have put back in a day and a half. But Captain Watkins felt justified in earning his freight and passage money for his owners. He went on with his port engine alone working, and brought his ship into Southampton in safety and without any aid in ten days and a quarter from the time he left New York. Thus but three days were lost, no extra expense was incurred, and the whole of the passengers carried were delighted at the avoidance of delay and at the well-merited confidence the master displayed in the ship.

These three stories seem, each in its own way, to have a very strong bearing on the much discussed question of single v. twin-screws in passenger ships.

The British Shipowners' Company

was established as long ago as the year 1864. It for many years confined its attention to sailing vessels. About the year 1879, however, those who managed its affairs realised that the low-powered steamship with compound engines was a better freight owning machine than the sailer, which depended on the more or less uncertain powers, aids which nature provides at sea. One, however, must not forget to credit nature with the fact that she also provides the coal to make steam, and the expansive properties which make steam so valuable as a motive power. But to return to the British Shipowners. They have from time to time owned about a dozen steam vessels. But they have turned them over very quickly, and never had very many at any one period. Now they have some five at work and one building. Formerly Messrs. Harland & Wolff built all their steamers, including some three or four which were transferred to the Nederland American Line. Latterly, however, the Palmer Co., of Newcastle, has had the monopoly of their orders.

The company seems to have fallen to some small extent on evil days, and its directorate have boldly faced the situation. The nominal capital of the company is a million sterling. This is in ten-pound shares, of which seven pounds ten shillings per share has been called up on the shares which have been issued. There is now a proposal before the shareholders to recognise the loss which has been made, and to take steps to put the concern in a thoroughly sound position by reducing the capital by one-half. If this proposal goes through the nominal capital will stand at half a million in five-pound shares, with a liability un-called up of twenty-five shillings a share on the issued capital.

This is a very good example to certain other shipping companies who carry on without taking in sail, although it is universally apparent that they have no assets to represent a material part of the capital they have expended.

The Record for Speed.

The *Lucania* seems not yet to have shown us her best paces. At all events she has just broken an important record. On her eastward run in March she did 531 nautical miles in a single day's steaming. This was four miles more than she had herself ever done before, though her sister, the *Campania*, had, it is true, done a little better. The *Kaiser Wilhelm Der Grosse* has never held this record for a day's steaming to the east, and it is now set up high against her. Just to show that she really meant it, and that there was no fluke about the matter, the five-year-old *Lucania* did another phenomenal run the day following this achievement, making 530 nautical miles that day. This, of course, but for what had just happened, would have been a record also. The whole passage was a fast one, averaging 21·93 knots over the whole voyage. The time was nothing very remarkable for her, being 5 days 12 hours and 19 minutes; but it was over the long course, and at a later stage of the year this speed would over the short course have reduced the run to something under 5 days 7 hours. The *Campania*, too, has been making good passages during the recent heavy weather.

Deaths.

The death is announced as having taken place at New York on the 21st February, of Captain Robert Bond, who was formerly in command of various liners of the old Inman Company. He continued in the service of the American Line when the change of proprietorship took place, and when the *Chester* was laid up he was transferred to the *Kensington* and to the Antwerp route.

The death of Sir Henry Bessemer will be a national loss, for he it was who made steel commercially available for the shipbuilder and marine engineer. But he will be remembered also for his design of the Bessemer steamer—the vessel which was to have annihilated sea-sickness on the Channel passage. What his patent hydraulic saloon could or could not have done in that direction was never really known. For the ship was a failure in herself. She was too big for the French harbours in their then condition, and her speed was by no means up to what was considered necessary. Others beside Sir Henry Bessemer may claim some sort of responsibility for the failure of the Bessemer ship, though his name was most prominently before the public in this connection.

Fair and Foul Weather from a Floating Studio.

Under this title Mr. Dowdeswell, of Broad Street, is opening an exhibition of Messrs. W. L. Wyllie's works. His artistic productions need no commendation of mine. They speak for themselves, and are familiar to all my readers. But all marine engineers who have opportunity should support the exhibition, for it is certain that if Mr. Rudyard Kipling in his powerful verses, "McAndrew's Hymn," has first given expression to the undoubted poetry which surrounds their calling, Mr. Wyllie has in the same manner shown that the artist can equally with the poet find grand material for his art in the steel-built creations of the shipbuilder and engineer.

Apropos of this exhibition, I may refer to a cutting sent me by a kind and indefatigable Bristol correspondent. The extract in question comes from a West country daily paper, and refers to the exhibition in question. In it occurs the following sentence, which is worthy, I think, of preservation. "We see the warship *Chester* lying, no less proud of its strength than of its guardian mission, off Netley Hospital." My readers will look in vain for H.M.S. *Chester* in the Navy List. My naval colleague will not be able to help them. She is not. The vessel mistaken for her is the fine old American liner *Chester*, which long has lain off Netley, not as guardship, but as one of the great unemployed. She has lain there a couple of years at least, and is as little like a smart warship now as can be. Strong indeed she was in construction, but certainly never for offence or defence, and her "mission," I fear, is not guarding the hospital, but awaiting the inevitable, if long delayed, advent of the ship-breaker, or, at best, the "agent for Klondike."

Disasters.

The stranding of their mail steamer *China* will be a very heavy blow to the P. & O. Company. She is, of course, quite a new vessel. She was at the time of the casualty homeward bound on her fourth trip with the Australian mails. Captain De Horne, who was a long time in command of the *Carthage*, has had her during the whole of her brief career, except her maiden trip, when she went out under the command of Captain Harris. She has been sufficiently described in these columns on previous occasions. But perhaps it may be well to briefly recapitulate matters. She is a single-screw vessel, and was launched by Messrs. Harland & Wolff at Belfast as recently as the 13th June, 1896. She was just over 500 ft. long, and had three decks and nine bulkheads. Her net tonnage was 4,165 with 7,899 gross. The machinery, also by Messrs. Harland & Wolff, indicated 11,000 on trial. It consisted of one set of four-cylinder triple-expansion engines. The cylinders were one of 42½ in., one of 68 in., and two of 74½ in. diameter. The stroke was 6 ft. Steam at 170 lbs. pressure was supplied by three double and three single-ended boilers. The double-bottom extended for 97 ft. in the forepart of the ship, and for 160 ft. aft as well as under the machinery compartment, so that she seemed well protected against damage from stranding. The vessel arrived from Belfast at Gravesend at the beginning of December, 1896, and she sailed in the course of the month on her maiden trip. Not to mention earlier casualties, it will not be forgotten that Perim Island cost the company their fine cargo-boat, *Hong Kong*, a few years ago, though it is fortunate that in that case also all loss of life was avoided.

The extraordinary, and I should almost imagine unprecedented, accident to the Ostend liner *Marie Henriette*, on the morning of the 24th March, ought to be a lesson to those few companies who still attempt to retain the paddle as the mode of propulsion for fast vessels. The constant breakdowns which one sees reported through loss of floats, and suchlike, are inconvenient, expensive, and annoying. But an accident of the present kind, where the shaft breaks near the ship's side, and drops the whole structure from one side of the ship, is positively alarming. Apart from the risk that in its fall some part of the wreckage might hole the hull, there is a very considerable danger that a steamship relieved of such a weight would roll over on the other side, and the handling of such a disabled craft in the weather then prevailing reflects great credit on those in command.

Marine engineers will read with pleasure the report of the salvage suit just tried in the Admiralty Court, on behalf of the steamship *Blenheim*, for the rescue of the steamer *Drummond* and her cargo. The *Drummond* had a very rough experience, and suffered much deck damage, had her fires extinguished, her steering gear broken, and was leaking in heavy weather off the Portuguese coast, whilst no less than a dozen of her crew had received serious injuries in the performance of their duty. Up came a German steamer. The master of the *Drummond* asked the German to tow his vessel into port. But the other declined, as he did not think it feasible. So the crew of the *Drummond* very justifiably left her. Next day up came the *Blenheim*. The weather was then a little less severe. The mate, third engineer, and some other of the *Blenheim's* crew went aboard. The third engineer went below. He found water coming into the engine-room through two cocks. These he succeeded in closing though at great personal risk. In fact, as it was, he was bruised all over through the terrible plunges of the unmanageable vessel. He persevered, however, and even got a little steam and somewhat reduced the level of the water. But eventually the ship had to be towed in, a helpless unsteerable mass. Her value was some £26,000, and the award was £9,500. Of this the owners of the *Blenheim* took £6,550, as there was held to be great danger to the salving ship. The master got £1,000 as his share, and the chief officer and third engineer got double shares out of the £2,000, which was allotted to the crew. The judge spoke especially highly of the third engineer's services.

GODDIN'S PATENT "POSITIVE GRIP" LOCK NUT.

In the adjoining diagrams we illustrate a new form of lock nut, which has been invented by Mr. E. A. Goddin, of 3, St. George's Avenue, Aldermanbury, London. In designing this nut the inventor has aimed at producing a device which would embody all the advantages of the old-fashioned double lock nut, while at the same time eliminating its disadvantages. The latter, which are well known, consist of the frictional contact being put on the wrong surface of the thread, which is clearly illustrated in Fig. 3, causing the nut next to the work to be lifted off the bolt thread when pressure is applied to it, and of the device being in two parts, which are liable to be lost, and which when in use are liable to relative rotation, thereby defeating the object of their use.

In Figs. 1 and 2 we illustrate sectional views of the new nut, the former figure showing its engagement on a bolt. This nut has two uniformly threaded portions, which are united by an annular spring part normally holding them slightly out of pitch. When the nut is applied to a bolt or other screwed device, its second or upper threaded portion will not be entered until it has been pushed outward sufficiently by the continued on-screwing of the nut, to re-establish the continuity of its thread, whereafter it will be found that the nut can only be screwed on against a heavy but elastic frictional resistance caused by the operation of the annular spring part.

It will be seen in this way that the bolt forces the two threaded portions of the nut apart, while the annular spring part tends to return them to their normal condition, in which attempt they firmly grip the bolt between them, and any force, vibratory or otherwise, which is applied to either face of the nut, will only force it into more intimate contact with the bolt, and so improve the lock. The annular spring part, in urging the threaded portions of the nut together, causes them to exert a heavy pressure upon the top face of the entire thread of the lower portion of the nut and an equal pressure upon the opposite or bottom face of the entire thread of the upper portion of the nut, so that every part of the nut is caused to oppose its turning with a force which is only limited by the strength of its thread. This force may be regulated in the manufacture by varying the dimension of the annular spring part by using material having the desired elastic strength, or by squeezing the two parts of the nut together to a greater or less extent after tapping.

By reference to Fig. 1, which is exaggerated as to details, it will be seen that there is a space above the bolt thread, in the lower part of the nut, but not in the upper part; this is owing to the fact that when the bolt begins to enter the upper portion, the pressure is taken by a very small portion of the thread in that part of the nut, which is consequently slightly bent upwards, and so decreases the space between it and the next convolution of the thread, so that the bolt has to wedge its way between the threads of the upper portion of the nut. This minute distortion, which gradually decreases as the bearing area of the threads in the second portion increases, is rectified by the wedging action of the bolt, which restores the distorted portions to their proper condition, as it gets further into the upper section of the nut, and at the same time causes the annular spring part to yield instead.

It will thus be seen, that the result of this temporary displacement of the thread is to make every part affected hug the bolt threads in a manner otherwise difficult to obtain, in fact, it produces a "ground in" fit. We understand that tests made on nuts made of Bessemer steel, have shown that on bolts of $\frac{7}{8}$ in. diameter, a weight of 60 lbs. on a 12 in. lever was necessary to overcome the frictional resistance of the nut, and when on the bolt, the nut has been found to measure $\frac{1}{250}$ in. more than when off the bolt, which shows the amount of elasticity giving a good frictional grip.

Fig. 3.

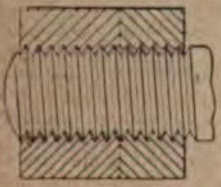


Fig. 1.

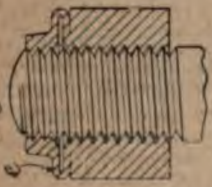


Fig. 2.

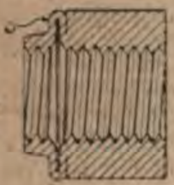


Fig. 5.

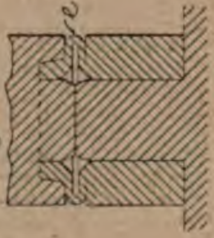


Fig. 4.

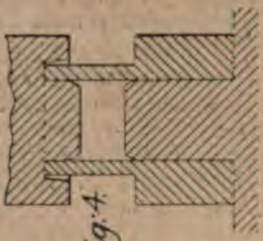


Fig. 8.

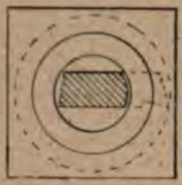


Fig. 9.

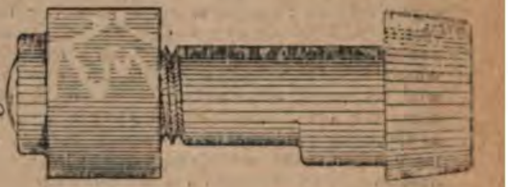


Fig. 6.

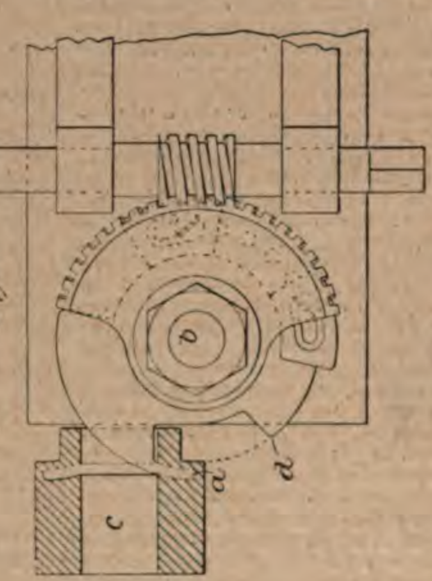
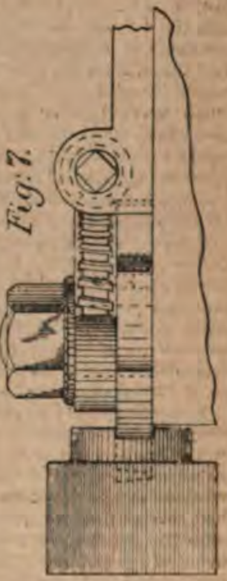


Fig. 7.



In manufacturing this nut a blank, such as shown in Fig. 4, is placed while hot between two parts of a divided mandrel, which are brought together, with the result that the walls of the neck are first slightly thickened, and then forced outwardly, so as to produce an annular corrugation, as shown in Fig. 5. The blank is tapped in the usual way, and then longitudinally compressed, so as to bring the two threaded parts a little nearer to each other.

In manufacturing large nuts the annular spring part may be produced by cutting a groove on the interior, a tool for which is illustrated in Figs. 6, 7 and 8. This tool consists of a device pivotted on the stud (*b*), having a recessing tool (*a*) for forming the groove or annular spring part in the nut (*c*), which is rotated in a lathe or similar machine, and a cutting edge (*d*) for trueing up the upper collar of the nut. Two adjustable stops are provided on the foundation plate which are adapted to co-act with abutments on the tool. The operation of the tool is effected by a worm and worm-wheel gearing. Fig. 9 is a view of an ordinary fish bolt with this nut.

It is claimed that the cost of this nut in manufacture is less than for a pair of the ordinary double nuts.

THE GENERAL SECRETARY OF THE STEAM ENGINE MAKERS' SOCIETY ON THE LATE ENGINEERING TRADES DISPUTE.

In his introductory address to the members which accompanies the seventy-third annual report of the Steam Engine Makers' Society, Mr. James Swift, the general secretary, enters into critical comments of the recent dispute, which will not be pleasant reading for some of the socialistic labour leaders with whom Mr. Swift, who is a representative of the old type of trade unionists, has no sympathy whatever. After briefly dealing with the financial results of the strike and lock-out as they had affected his own society, which had involved a special strike expenditure of £40,000 and had reduced the funds to the extent of £10,000, but which had by no means "smashed up" their society, whatever the disastrous results to other organisations might have been, Mr. Swift comments upon some of the causes which led up to the protracted dispute and the effects to the workmen which have followed. "Few thoughtful men," he says, "will deny that it could have been avoided had reason prevailed, and not angry passions forced an issue. In our last annual report we pointed out the combination of employers which was then springing up, and the need for care in dealing with trade matters. At that time the Employers' Federation only numbered about 100 firms; now it includes nearly 800, as shown by their list of adherents. Early in 1897 threats were made of lock-outs on different questions, notably the machine question. The cases where these arose were firms where we had few, if any members, whilst, as we do not admit machinemen into the society, we had no voice in the matter, although our members were bound to be affected in the event of a lock-out. For the time being this was averted, but meanwhile the eight hours' claim in London was being pushed to the front. Short notice was given our members to attend meetings, where it had previously been decreed that an issue should be forced. The result is now well known; youthful impetuosity prevailed over mature experience; history had to be made to justify official existence, and show what could be done by heroics. The eight hours is the aspiration of the artisan, and movements in this direction were being made by cognate trades to secure it by conciliatory means, which they were sanguine enough to believe would have met with success, or a step in the direction of less standard hours than at present. Defeat, however, was prominent early in the contest, and, as time went on, it was seen that a settlement was not to be effected by a surrender, but an indemnity insisted on in addition.

"The indemnity was, as shown by the Federation terms, at the first conference at Westminster, that the Employers' Federation intended to use their giant strength like a giant, and crush the workman and make his society powerless to help him. For seven days the men's delegates strove to secure an honourable settlement; but as time went on it was seen that the conditions had been fully settled beforehand, from which the federated employers would not recede. These conditions were put before the trade to vote upon, and almost unanimously rejected by the men. Again a conference was held, when, with slight modifications, the former conditions, if in other words, were insisted on, and again rejected by the men. This second denial was met by an extension of the lock-out, and whilst Christmas greetings were being uttered—'Peace on earth, goodwill to men'—the emissaries of the employers were hard at work, persuading or coercing other neutral firms to lock out their men, and add to the misery and poverty that had already been felt in the country. This callous action, coupled with other causes, led to advice being given that a settlement be made, and the distress which had been so keenly and extensively felt thereby curtailed. To picture the many homes that were destroyed, the many willing hands laid idle, would be a painful duty, yet the vivacious chairman of the Federated Employers, in a recent after-dinner speech, said, 'There was nothing he felt so thoroughly proud of as the fact that in the near future they (the workmen) would look upon him as their best friend.' Whether this will be so we can leave the future to prove, but meantime we have abundant evidence that at present he is not admired by the artizan, although he may not be responsible for what some of his colleagues at other firms are now putting into force."

After a criticism and strong condemnation from a trade union point of view of the Federated Employers' overtures to the foremen to leave their own trade societies and join a society which was to be subsidised by the employers, and also still more strongly condemning the "character" system that had been introduced by the Federation, which to many of the men practically closed the doors of nearly 800 federated firms in the United Kingdom, Mr. Swift proceeds:—

"The foregoing are part of the results of defeat, and even these will not be the worst. We may see and feel the effects already, but with a decline in trade it will be even more so. There are employers *and* employers; some who are anxious to do justice to their employés, and others who, with an air of militarism, assert they are captains of industry, and by their acts, try to dragoon the workman in a way that goads him to rebellion. One of these, in a recent after-dinner speech, said: 'Unfortunately, the men had been led away by sophistry, by the idea that somehow or other the unions could do better for them than the chaps who paid them their wages. They (the employers) could now go home feeling that they could do what they liked with their own; they could talk and say that they would have the thing done at this or that price, or not done at all. It must be thoroughly understood that the man who paid the wages was the man who was master of his own shop.' The same speech was profuse in allusion to brains, sneers at windbags, and bellicose in tone, and, taken as a whole, can be classed as vulgar bunkum from a wealthy capitalist; but a *bona-fide* workman's representative would blush for himself if it was a report of his utterances to the general public.

"Whilst we may have to receive many such lectures, tolerate conditions that are unpleasant, and earn that which provides food for our families, we must not be too hasty in threats of retaliation or acts of rebellion. We must take time for reflection, meditate how we can regain our recent losses, and guard our interests when trade is not so good as it is to-day. We must see to our finances, as these are equal to the ammunition a soldier carries with him into the field of battle, and this has been very clearly demonstrated in the late struggle. Some scoff at the question of finance, and insist that trade unionism consists of a large army on paper, and to be continuously at war with the capitalist until he is exterminated; but, as a rule, these theorists leave the storing of ammunition till they get into the fight, and then appeal to lookers-on to find it for them. We are not of this class, and our attitude in the recent eight-months' struggle proves it. From past observations we had seen this conflict pending, and our paucity in numbers made us to a great extent powerless when the dominant party declared for some progressive movement. If, in these times, we demurred, or suggested a middle course, we were at once dubbed 'slow or dormant,' but if our past policy as a society had been copied by others, the trade would not be in its present position, nor the present danger of other trades having to go through a like trial hereafter."

Mr. Swift follows with some sarcastic comments on the "so-called friends of labour hungering for notoriety, and anxious to shine in public print," who had imparted bitterness into the conflict and not only prolonged its duration, but rendered more stringent the terms of settlement, and then concludes with the subjoined very pertinent remarks that it would be well if some of the too impulsive, and not a few of the irresponsible, labour leaders would carefully consider:—

"Schemes of federation," he remarks, "are numerous, and individuals who have not been a success on local bodies are full of theories as to how the masses can combine and dominate the classes. There is an old maxim 'Never legislate in a panic,' and it is applicable in our case. Let us not, whilst smarting under our present position, rush into any scheme, however plausible on paper, which can only be taken as theory, so would be dangerous to put into practice. It is argued that, because employers in the engineering trade have formed an association and called it a Federation, that it has acted as a victorious gladiator. It is not a federation in the true sense of the word, as it is simply a combination of employers in one industry, not a federation of employers in every industry in the country. Such a federation, however, is possible, if the Trades Union Federation scheme of some advocates is put in operation, and if so, we have no hesitation in saying that Labour Federation would suffer, as capitalists could always have food to eat, but labour has to first earn that which purchases his moderate diet. The recent lock-out is an object lesson: that if employers in one trade can combine, employers in all trades can federate, and, if they decreed, could put half a million workmen on the funds of a

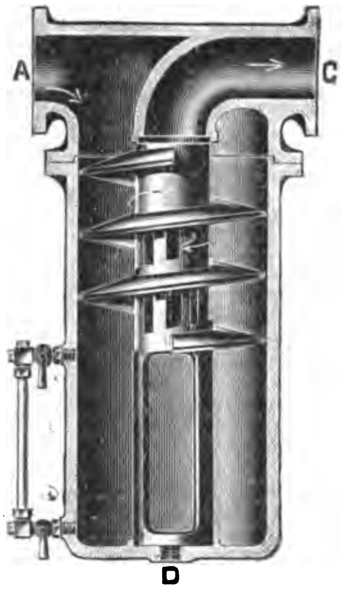
Labour Federation at short notice, and it needs no demonstration to show where the want of capital would soon be felt by labour. One point would be quickly apparent, and that is that each society would lose its autonomy, and become subservient on trade matters to a foreign authority, and have to obey their commands. Beyond this is the interference of one trade with another, and jealousies that exist have already been shown, in cognate trades federating, that it can be compared to oil and water, impossible to assimilate. As to forming a huge trade union of all trades as a mere fighting machine, it is fallacious, and even in separate industries has been found to be a failure. Such bodies are found to be spasmodic, rise into existence during prosperity, and make a wide field for the demagogue for the time being; but when this individual cannot carry out his predictions of future victory, and only proves like a mirage in the desert, the associations lapse, and he goes on some other line, or seeks some other scheme that eventually meets with the same fate.

"It is said history repeats itself, and this applies to the labour movement at present. In 1872-76 rapid strides were made in the trade union movement, and an extensive federation was formed by employers in all industries, free labour associations established, and an organ published under the title of *Capital and Labour*, which was heavily subsidised, and in many cases labour suffered severely. The trade depression of 1878 to 1880 saw a drain on trade union funds, and a collapse of the Employers' Federation, whilst their subsidised organ was thrown open to writers who advocated the men's views, and before its career ended there appeared articles on behalf of labour, that showed the pen was sharper than the sword, and the workmen's advocates had the last say, at the expense of the capitalists.

"We believe that history will again repeat itself, and that the Employers' Federation in the engineering trade will pass into obscurity with the first decline in trade, providing there are no rash steps taken by indiscretion to force them into activity in the meantime. Such being the case, our past policy should be repeated; to gain by diplomacy all we possibly can, and when gained consolidate it: get one foot firmly on the rung of the ladder before attempting to step on one higher."

THE "STEMTRIFF" STEAM SEPARATOR.

THE accompanying illustration shows the new patent "Stemtriff" steam separator, which is being introduced by the Empire Engineering Co., of Failsworth, Manchester. This apparatus is specially adapted for marine requirements, and is being supplied to many of the leading firms in this country as well as to large engineers in Egypt and Canada. The action of the instrument is as follows:—Steam enters the separator at A and in attempting to escape at the outlet C, it is forced to follow the convolutions of the inclined worm, as is shown in sketch. In rushing round and round any moisture or dirt is thrown away from the centre, and is ultimately carried to the bottom of the casing. It will thus be seen that dry steam only is collected through the apertures in the centre of the upright column, so that by the time the current of steam gets to the end of the worm, it becomes practically exhausted of all moisture, and has therefore no tendency to take up any water that may be lying at the bottom of the casing, when effecting its exit towards the outlet C. The blades of the worm are inclined from the centre, so that any water formed naturally flows away from the point where the dry steam is collected, irrespective of the centrifugal action which is constantly in force to throw any moisture as far away from the centre as possible. It is, of course, of supreme importance in marine work to ensure dry steam, and when boilers are constantly priming, owing either to the action brought about by the motion of the ship or the introduction of dirty water into the boiler, this instrument will extract all moisture from the steam on its way to the engines. Another feature is the adaptability of these instruments to the extraction of grease or dirt from exhaust steam, and thus saving the expense and constant trouble attendant on the use of filters, the steam being quite clean after leaving the separator. For marine work this is very important. It may be added that these separators are made for both horizontal and vertical pipes—the one illustrated being of the former pattern.



NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The Naval Estimates.

THE Naval Estimates for the financial year just commencing are now before us, and according to them the colossal sum of £25,550,000 is to be spent upon the Navy during the next twelve months. The Estimates alone are for a net total of £23,878,400, a net increase of £1,440,400 over those of last year, which included a supplementary Estimate of £500,000. The increase in the number of officers, men, and boys proposed, has necessitated an increase in nearly every vote connected with the personnel. The Works vote for the coming year does not differ materially from that of the present year. The shipbuilding vote shows an increase of £1,571,000 over the original Estimate of 1897-98, but £1,400,000 of this sum represents money unexpended during the past financial year, chiefly owing to the dispute in the engineering trade. The number of officers, seamen, etc., voted for 1897-98 was 100,050, but this year these number will be brought up to 106,390, the increase being made up of 200 officers, 2,400 seamen, 284 engine-room artificers, 1,700 stokers, 1,000 Marines, 300 boys and 456 artisans and miscellaneous ratings. Of the 200 officers, half of them will be engineers, including 50 warrant officers, to be called artificer engineers. A committee has been appointed to investigate the general question of recruiting for the Navy, the report of which is now under consideration. With the view of retaining as many artificers as possible, after they have completed time for pension, an order in Council has been obtained extending to engine-room ratings the privilege of sixpence a day "extension pay," allowed in other cases of men who remain in the service after completing time for pension. Coming to the marines, the total number of recruits raised during the year was 2,665. Very few of these were over twenty years of age. The emoluments too of Royal Marine officers afloat has been improved somewhat, senior officers receiving a flag allowance when employed in ships carrying the flags or broad pennants of flag officers or commodores. As regards the Royal Naval Reserve, provision is to be made to increase the list of executive officers by 100. Instruction has been given to a small experimental class of engineer officers of the Royal Naval Reserve in the Portsmouth. Steam Reserve between October 1st, and December 31st last, in order that they may acquire a knowledge of the working of the engines and boilers at present used in the ships of the Royal Navy.

The Naval Estimates, Construction, &c.

The recently settled labour difficulties has seriously affected the expenditure on new construction, and the payments to contractors have been so disarranged by the dispute that even now it is not easy to state the exact amount by which the anticipated expenditure on new construction will fall short. It is calculated to be about £2,270,000. £1,400,000 of this will fall in 1898-9, the remainder on 1899-1900 and 1900-1. The dockyards have apparently suffered nearly as much as the private contractors. The delays on the part of contractors in the delivery and completion of machinery and armour have involved a great amount of difficulty in carrying out the work of construction as rapidly as desired. The steam and gunnery trials of certain ships have also been considerably delayed. As regards the private contractors, a considerable number of ships, which in the ordinary course would have been delivered and completed during 1897-8, are still at the yards. The time lost may be roughly set down as the length of time over which the dispute extended. Coming to the new shipbuilding programme, it is proposed to commence three battleships, four armoured cruisers, and four sloops. The battleships and two of the sloops will be built in the Royal dockyards, the rest by contract. The number of hands employed at the Government yards will be kept up to their full strength. Many of the new ships still in the hands of the builders would have reached the trial stage during the past financial year if it were were not for the labour difficulty cropping up. The experiments to be made with different types of water-tube boilers in torpedo gunboats have not as yet been carried out, but it is expected that the *Salamander*, with Mumford boilers, and *Seagull*, with Niclausse boilers, will be tried at an early date. The results of the trials of ships now being prepared for commission are mentioned, but these are too well known to need repetition. The engineering dispute has also affected the output of armour, but in the financial year just commencing it is expected that very large deliveries will be made, as considerable alterations and additions of plant had to be made last year owing to the introduction of new qualities of armour. The manufacture of naval ordnance proceeds satisfactorily, and is keeping pace with the requirements of the fleet. A new and more powerful 6-in. quick-firing gun than the present one has been adopted, and its manufacture is now proceeding. Altogether the Estimates are satisfactory, and such criticism as has been raised seems to indicate that the sum asked for by Mr. Goschen is much less than was expected.

Delays in Construction.

The delays which have occurred in the building of our battleships and cruisers recently have been attracting attention everywhere. In reply to a question by Mr. Yoxall in the House of Commons, Mr. Macartney said that the contract dates for the delivery of the ships building in private yards were:—*Glory*, August 11th, 1899: *Albion*, August 15th, 1899. The contract dates for complete delivery of the casemates for the dockyard ships were:—*Ocean*, February 7th, 1898: *Canopus*, April 28th, 1898; *Goliath*, April 28th, 1898. As is well known, the *Canopus* class are terribly behindhand, and the battleships provided for in last year's programme have not yet been commenced. The same applies to the new armoured cruisers, and only two of the small cruisers are as yet in hand. Although the *Gladiator* has been launched 15 months, she has only just got her machinery on board, and it is not expected that she will be ready for sea until the end of the present year. At this rate our warships will be out of date, and will need more up-to-date armaments and machinery by the time they are ready to hoist the pennant. A writer in the *Nineteenth Century* has summarised the delay in construction as follows:—"We are at the present moment short of two battleships, four first-class cruisers of the *Diadem* class, three second-class cruisers of the *Arrogant* type, and seven cruisers similar to the *Pelorus*." The ever-present dispute in the engineering trade is said to be responsible for this, but we think the Admiralty have it in their power to hurry matters somewhat if they choose.

The "Powerful's" Breakdown.

The defects which are alleged to have been developed by the *Powerful*, now in Chinese waters, do not appear to be of a very serious character after all. The defects are not serious enough to incapacitate her altogether, although until they have been thoroughly remedied it would not be advisable to drive her at a very high speed. It is doubtful, too, whether proper facilities for her repair exist at Hong Kong, and it is thought by some that she will have to be sent home before her present commission is completed. Mr. Goschen states that such is not the case. The bearings appear to have been worn down internally to the extent of a small fraction, and the brasses will have to be refitted, but, as Mr. Goschen said, this is not an unusual defect after a long passage. Mr. W. Allan, M.P., asserted that the vessel had taken ten days to steam 1,500 miles, and that the coal expenditure on the voyage had been heavy. There seems to be little doubt about this, for the cost of coal for the journey from Portsmouth to Hong Kong would seem to work out at about £11,000, or a total of about 8,300 tons. A correspondent writing from Hong Kong states that the ship was 49 days 7 hours under steam between Portsmouth and Hong Kong, and this would give us an average speed of just over 12 knots. The second attempt to carry out the 24 hours trial ended in the ship reaching 16½ knots, which was maintained for ten hours, and then the port engine bearings gave out, and she had to stop to adjust. After this it was not considered advisable to steam at more that 40 revolutions. The *Powerful* and *Terrible* were built to satisfy a certain sort of public opinion, and have neither of them been brilliant successes, but on the other hand it cannot be said that they are altogether failures. It is expected that when the *Powerful* has completed a year on the China station she will proceed to Australia, and serve a year there, subsequently spending another year in the Pacific.

Portsmouth Dockyard.

The end of the financial year has found work at this yard somewhat slack, although this is not usually the case. The extension scheme will, it is hoped, soon take practical shape, although the negotiations between the Admiralty and the Corporation are not nearly over, and are not likely to be yet awhile. The departure of the *Queen* passed off satisfactorily, the event taking place in "Queen's weather." Work on the *Formidable*, as is usual now, was commenced weeks before she was officially commenced. By the end of the current month it is expected that the *Hannibal* will be out of hand, and extra hands have been working upon her for some weeks back. The gun trials of the *Diadem* are to take place shortly, and when they have been carried out she is to join the China squadron. The steam trials of the *Gladiator* are to take place at the end of May. About the middle of next month, too, the *Crescent* is to be out of dockyard hands, and her defects are being attended to with as much expedition as possible. It is thought by many here that she will go out to the Cape station, taking the place of the *Doris*, when she is ready. The old Cape flagship *St. George* has not yet had her defects seen to, but these are not very heavy. The authorities here have informed the Admiralty that the repairs to the *Gladiator* will occupy about two months: but in an emergency she could be made ready for sea in seven days. The Admiralty also inquired whether the *Terrible* could be ready for sea by the 24th ult. An answer was returned in the affirmative. The *Medea* is here for overhaul. Belleville boilers have been put into the torpedo gunboat *Seagull* with satisfactory results. The *Canopus* has had over 6,200 tons built into her up to date. She was launched about 54 weeks ago.

Our Food Supply in Wartime.

A very interesting correspondence has been going on in one of the daily papers on the power of the Navy to protect our commerce and food supplies, and upon the perils of starvation and surrender in time of war. The correspondence has been initiated by Admiral Close, whose views on the subject are those of the political extremist, and the letters are, in our opinion, more pessimistic than are warranted. Mr. R. Yarburgh, M.P., has entered into the argument, and in a letter states that circumstances might arise in which the United States would cease to supply us with corn and other foods. He considers that food is liable to be considered contraband of war without any breach of international law, but it must be taken into consideration that the interests which the United States have at stake in this connection are great, and that power behind the throne, the almighty dollar, might force the Government of that country to resist any attempt made by belligerents to deprive Great Britain of her supplies. Mr. T. H. H. Garrett contributes an interesting letter to the discussion, in which he says that even if we were able to grow the whole of our own wheat supply, and were independent of foreign sources of food, we should be no less dependent than we are now upon the efficient performance of certain functions by the Navy. We can neither produce nor store raw material. On this depends the wage, the purchasing power of the teeming population of our manufacturing districts and is as vital to them as food itself. No one will deny that the loss of a big naval battle would have terrible and far-reaching consequences in this country, and so it is hoped that some sound scheme will soon be forthcoming to ensure a good food supply for Great Britain in wartime.

New Guns for the Fleet.

Glancing through the Naval Estimates we come across the statement that the manufacture of guns is proceeding satisfactorily, and is keeping pace with the requirements of the Fleet. It is as well to know this, for in almost everything else connected with our battleships, such as armour, engines, &c., matters are not proceeding quite as satisfactorily as could be wished for. Ships still on the stocks should have been launched months ago, and many undergoing their trials have developed serious defects. However, to return to the guns. It is stated that the conversion of 6-in. and 4-in. breech-loading guns to quick-firers will be completed at an early date in the financial year 1898-99. Also that a new and more powerful 6-in. quick-firing gun than the present one has, after exhaustive tests, been adopted, and its manufacture for future ships is proceeding. Until now it has not been found possible to manufacture a quick-firing gun which, while able to fire with safety and rapidity, does not require the heavy and expensive brass cartridge cases which have hitherto been thought indispensable. In the new gun this drawback has been done away with, and the adoption of the new plan will, it is said, cause a great saving in the cost and weight of ammunition and of the space required to stow it. The heavy guns constituting the main armaments of new battleships are to be more powerful weapons than the present corresponding guns afloat, and their manufacture has been commenced. It was calculated that by now the Fleet would have been equipped throughout with the Lee-Metford magazine rifle.

Devonport Dockyard.

There is quite an abundance of work here, and the financial year now commencing promises to be an exceptionally prosperous one for this yard. The activity which has reigned here for so long is apparently to be maintained. The improved facilities which now exist are to be taken the fullest advantage of, for the building and refitting programme is pretty extensive. The Chief Engineer's department is to contribute its full share of the work. As soon as the *Ocean* is launched, the *Implacable* will take her place, and already tons of material are being got in readiness for her. The *Psyche* makes good progress, and her launch will not be very far behind that of the *Ocean*. In this connection it may be mentioned that the weight of the *Ocean* when launched will be greater than was expected, some 8,000 tons having been built into her. A deal of the work usually done when a newly-built vessel is in the completing stage has been done, and she will have to carry much heavy material down the launching ways which, in the ordinary course of events, would have been built into her after this event. Entertaining the crew of the *Philomel* on their return home was a step in the right direction, and all concerned have combined to sound the praises of the ship's crew, which certainly did much arduous work on the West Coast of Africa. The *Rapid*, *Wild Swan*, and *Orlando* will shortly be taken in hand. The new sheer logs erected here are 150 ft. long, and are guaranteed to lift 100 tons. The cost of the sheers with the machinery required to work them will be £11,000. The foundations and extension on the jetty necessary for their erection have cost £38,000. The *Furious* will shortly be ready for her steam trials. The *Prince Albert* and the cruisers, *Conquest* and *Carysfort*, are to be removed from the effective list at last, on instructions from the Admiralty. The *Hermione* is to be commissioned on the 7th of this month for service on the China station.

The Russian Navy.

It has come somewhat as a surprise to many to hear that the Czar has authorized the expenditure of £9,500,000 on shipbuilding. This enormous sum is more than three times what it was originally proposed to spend on construction, but it is apparently to be spread over seven years, for which fact we may feel relieved. Admiral Tyrtoff originally asked for nearly twenty million sterling, but the Minister of Finance could not provide such a sum out of the resources at his disposal, and the idea of a loan was not relished. It is evident that the authorities at St. Petersburgh are resolved to very much strengthen the Russian Fleet, but it is doubtful if they have facilities enough to lay down such a number of ships as apparently it is intended to commence, and negotiations are said to have been opened with American builders. More armour for Russian warships has been ordered from the United States, and in any case it is a feather in the cap of the American makers to have secured such a large contract. The Carnegie Steel Co. is to supply sufficient Harveyised nickel steel armour to complete two of the battleships now under construction, the *Peresviet* and the *Oslabya*. Bids from English, French, German, and Austrian firms were refused.

German Naval Ambitions.

Germany seems determined to make itself a naval power, and that as soon as possible. Originally it was intended that the work of building up the Navy should spread over seven years, but this has now been decreased to six, and during this period some sixty warships are to be built, including 17 battleships, 8 coast defence armour-clads, and 9 large and 26 small cruisers. Thus in a few years' time the German Navy will be a sea force which will have to be reckoned with each year when the British Government is framing the Naval Estimates. In the discussion on the Bill, Herr Lieber proposed that the purposes of the Government as to the constitution of squadrons and divisions should be included in the Bill. In order to meet the objection of those who say that the new measure, by laying down the age at which vessels are to be replaced by others, imposes much more than a septennate upon the country, he would insert the words "as a rule," though even then no departure from the rule would be valid without the consent of the Federal Council and the Reichstag. The Government success has certainly been a complete one.

Chatham Dockyard.

The financial year 1898-99 is expected to be an exceptionally busy one here, and the number of hands will shortly be increased. The *Illustrious* has come through the whole of her trials in a manner highly pleasing to everyone. Her speed and H.P. under natural draught were in excess of the Admiralty requirements, and although the four hours' full power trial took place in very heavy weather, her engines developed 12,112 H.P., the average speed, with a steam pressure of 152 lb. per square inch working out at 15½ knots. This was slightly lower than would have been the case had better weather conditions prevailed. Her gun trials were entirely satisfactory, and the vessel was not affected in any way by the firing of her heavy barbette guns. She is to hoist the pennant about July next in the Channel Squadron. The *Goliath*, when launched, weighted about 5,500 tons. In order to have her ready, men had to work on her night and day. She will be finished by October next if possible. The *Pioneer* is making excellent progress, as does the *Vindictive*, although the number of hands employed on her lately have been small. The engineers' staff are confident that the estimated H.P. will be easily reached. The *Tartar* has been in hand here for some time, having her breechloaders replaced with 6 in. quick-firers. She is also undergoing a thorough overhauling of her machinery. The *Dreadnought* is also being reboilered and repaired, and having her auxiliary armament strengthened. Breechloaders are to take the place of her obsolete muzzle-loaders. The *Cleopatra*, now in dock here, will relieve the *Calypso* on her return to England with the training squadron.

Our Torpedo-boat Destroyers.

Two serious accidents to torpedo-boat destroyers have happened within the last week or so. The first to get into trouble was the *Mallard*, which came into collision with the screw steamer *Ethel*. Her bow was damaged somewhat seriously, and she was obliged to steam back to Sheerness Harbour with her bow covered with canvas, and subsequently proceeded to Chatham for repair. The *Ethel* was considerably damaged. The *Sturgeon* was the other destroyer to get into serious trouble. The bracket which holds her shaft and propeller broke away, and the shafting having nothing to support it became erratic in its operation and caused a deal of damage. One of the propeller blades was fractured, and the shafting was bent and twisted in every direction and her rudder smashed. The coal consumption trial of the *Flying Fish* has given satisfaction to all concerned. Her coal consumption worked out at 2·3 lbs. per H.P. per hour, and considering that she exceeded a speed of 30 knots, this must be reckoned the best result yet achieved by any of the Portsmouth destroyers. On her second 30-knot three hours' trial she worked up to her full speed within ten minutes of getting on the trial, and reached on one of her six runs on the mile the high speed of 31 knots. However, after one and a-half hours steaming the steam pipe leading to the starting valve broke and the trial was abandoned. The trials of the *Otter*, which were to have been carried out by the engineering staff from Keyham, at Greenock, had to be temporarily abandoned as the vessel fractured her crankshaft while carrying out a series of 30-knot speed runs and had to be fitted with a new crankshaft.

The Supply of Armour for the Navy.

That part of Mr. Goschen's speech on the Estimates referring to there sources of the country for the manufacture of armour plates does not seem to have met with much approval among the makers. In Mr. Goschen's opinion, if he has been reported aright, the resources of the country for the manufacture of armour plates are not sufficient so long as they were entirely in the hands of private firms, and that part of the work should be undertaken by Government. Delay in the fulfilment of contracts is said to be at the root of Mr. Goschen's statement, and this is of course due to the ubiquitous engineering dispute. Whatever goes wrong with the Navy nowadays is attributed to "the late engineering dispute." However, the *amour propre* of Sheffield has been touched, and one of the leading Midland papers has taken up the cudgels on behalf of the steel city. Part of the delay must, of course, be put down to the introduction of new plant by the various armour-making firms. The Harvey process, introduced some three years ago, involved the outlay by the makers of thousands of pounds in machinery, and as is perhaps well known, retarded the output of armour while the change from the old process to the new was in progress. The Harvey process now seems about to give way to the Krupp process, and another great change in plant, etc., has been necessitated. On top of this change came the engineering dispute, and for five months one firm was idle, while two others could only deliver plates slowly. It is contended that vessels have very rarely been kept waiting for armour, and the rapidity with which we can turn out warships of whatever size is pointed to as a proof of this. The work which the armour makers do for foreign Governments is considered by some to have had something to do with the delay, but this is certainly not the case, and it is denied that the interests of the Home Government have been in any way sacrificed to that of foreign Powers. The principal firms do not apparently attach much importance to the proposal, and Lord Charles Beresford, who has warmly defended Mr. Goschen's proposition, is spoken of as a "lively alarmist, who would have every fishing village on the coast turned into a naval dockyard." The cost of erecting Government plant for the erecting of armour plates would of course be enormous, and as the existing plant of the private makers is said to be all-sufficient for the Government wants, there is little chance of the authorities doing so.

Sheerness Dockyard.

A first-class programme of work has been allotted to this yard for 1898-99, in which new construction is a most prominent feature. The *Pomone* is to be ready on New Year's Day. When ready, the *Prometheus* and *Perseus* will come here to complete, and the principal repairing work will be on the *Buzzard*, *Philomel* and *Partridge*, *Sans Pariel*, *Wye* and *Hearty*, which has now completed her annual outfit. The *Speedy*, which only left here a few weeks ago, is to return before long to have her boilers retubed. She experienced trouble with them before she arrived at Gibraltar on her passage out. In any case, this would have been done on the occasion of her next refit. The *Dolphin* ought to be ready by now to enter upon her training duties on the Irish coast. She has returned her armament of two 6 in. and two 5 in. breech-loaders, and her equipment now consists of four 9-pounder guns. The shallow-draught steamer *Woodlark*, destined for service on African rivers, has carried out her gun trials satisfactorily. Her armament consists of two 6-pounder quick-firers and four Maxims.

Warships in the Canal

The details of the mishap to the *Victorious* have now come to hand, and some very interesting particulars have been furnished concerning the cause of the accident and the efforts made to refloat the battleship. It seems that the *Victorious* was following a pilot tug when she went aground. It has been contended by many that there must have been weak links in the cables which parted, but this contention is as likely as not an erroneous one. The chain which will stand a strain of 15,000 tons, a strong current, and an adverse wind, has yet to be made. When the first cable parted the engines were kept working, we are told, until the condensers became choked with sand and mud, and everything depended upon the second cable holding out. It failed to do so, and the *Victorious* went aground, where she stuck for 88 hours. 1,100 tons were taken out of her, and after much hard work and trouble she floated at 7.30 a.m. on February 16th. In 1894 the *Imperieuse*, with a maximum draught only 2 in. less than the *Victorious*, passed safely through the Canal when on her homeward voyage from China. Of course the width of the *Victorious's* beam may have had something to do with the grounding, for she has a beam of 75 ft., whereas that of the *Imperieuse* is only 62 ft. The statement that the Admiralty were themselves in doubt as to whether the ship could get through is entirely incorrect, for there never was any doubt as to her ability to get through,

The Death of a Great Inventor.

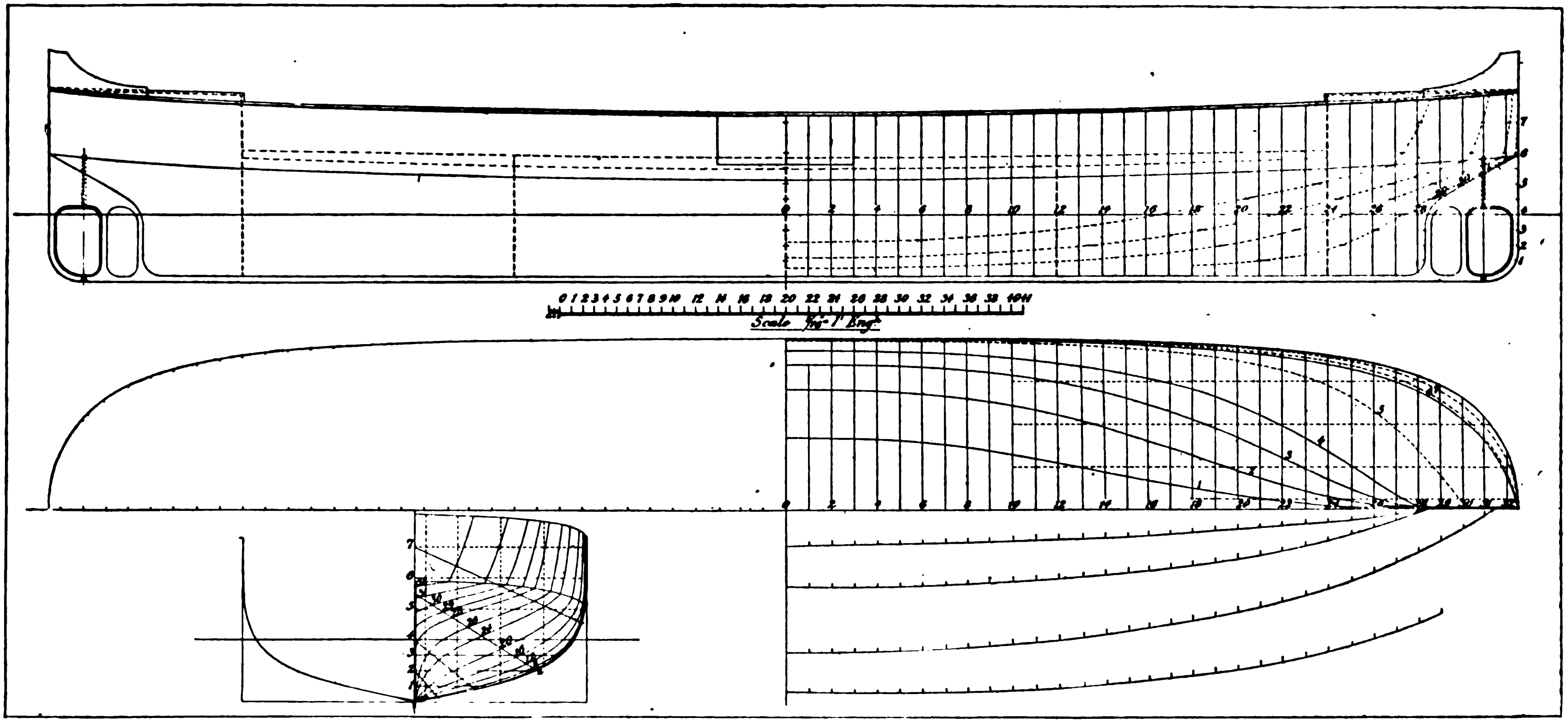
It is with much regret that we have to record the death of Sir Henry Bessemer, F.R.S., the great engineer and inventor. He was in his 86th year, and recently underwent a surgical operation, which has been considered to have hastened the end. His wife, whom he married in 1833, died only a few months ago. His greatest invention, and the one which brought him in the most money, was undoubtedly his discovery of the means of rapidly and cheaply converting pig-iron into steel by blowing from below a blast of air through the iron when it was in a state of fusion. Until Bessemer discovered this the price of steel was about £50 a ton, and only 50,000 tons were turned out yearly. In 1889 the amount of steel manufactured by the Bessemer process alone in Great Britain was 2,140,791 tons, and the cost, £5 a ton. Bessemer steel is now rapidly superseding the use of iron in the construction of almost everything formerly made of this metal. Another invention of Sir Henry's was his anti-seasickness steamer. But although the whole thing was extremely ingenious it did not answer, and the first trip of this curious vessel ended by her smashing Old Calais Pier. Many experiments were carried out afterwards, but none of them with any great amount of success, and the boat ended her career as an ordinary paddle-wheel steamer. Bessemer discovered his steel-making process in 1879. Out of it he made more than he did by any other invention, something like a million sterling. He was awarded medals and marks of distinction from almost every country in the world, and received the freedom of many cities, including London. In the United States he has a county and eight cities named after him.

Pembroke Dockyard.

The general tone of satisfaction which prevails at all the other Government shipbuilding yards is not quite so strongly expressed here, and some little disappointment has been felt, now that it is known that no new battleship is to be commenced this year. No ship of any kind is to be laid down. The three ships in hand the *Andromeda*, *Spartiate*, and the Royal yacht, will afford plenty of work for the present staff for a good twelve months, but no increase in the staff can possibly take place. A new casting for the phosphor bronze stem of the Royal yacht is to be made. It was originally intended to fit it in two parts, and one of the parts had been cast and put in place. According to a French contemporary, the name of the yacht is to be the *Albert and Victoria*, but too much reliance must not be placed upon this statement. The *Andromeda* now presents a very finished appearance, and the last of her four funnels have been fitted on board. The *Thunderer* is to leave here next month for Plymouth, to undergo the annual inspection of her underwater fittings. She is to be succeeded by either the *Camperdown* or *Anson*.

The Staff Engineer of the "Calliope."

The death of fleet-engineer H. G. Bourke, R.N., who died at Haslar, after a short illness, recalls to us the service he per-


0 1 2 3 4 5 6 7 8 9 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 ft
Scale

Double Screw Ferry Steamer "Bell-Brook." (*Fig.* 4.)

formed in March, 1889, in bringing the *Calliope* out of the harbour of Apia in the face of one of the most terrible gales known in that part of the world. At the time of the occurrence he was staff engineer of the *Calliope*, which was lying in Apia Harbour, Samoa, when a terrible hurricane came on, a hurricane which caused disaster as great as any since the introduction of steam. Of the seven men-of-war lying at anchor in the harbour, four were totally lost and two stranded, and 130 lives were sacrificed. When the gale was at its height, and many of the other vessels had been given up for lost, the *Calliope* steamed out of the harbour amidst the cheers of the foreign sailors on board the other unfortunate vessels. So much did the Admiralty think of Mr. Bourke's conduct, that in a special memorandum they said: "My Lords also highly appreciate the manner in which Captain Kane was supported by his officers and men, and they desire especially to express to staff engineer Bourke and his staff the satisfaction with which they have read that portion of Captain Kane's letter referring to the management of the engines during the time the vessel was under full pressure of steam. To the admirable manner in which the engines of the ship were worked may be attributed to a great extent the safety both of the ship and of all the lives on board." Expressions of regret at the death of Mr. Bourke are heard everywhere. He was within a short time of his retirement from the service altogether.

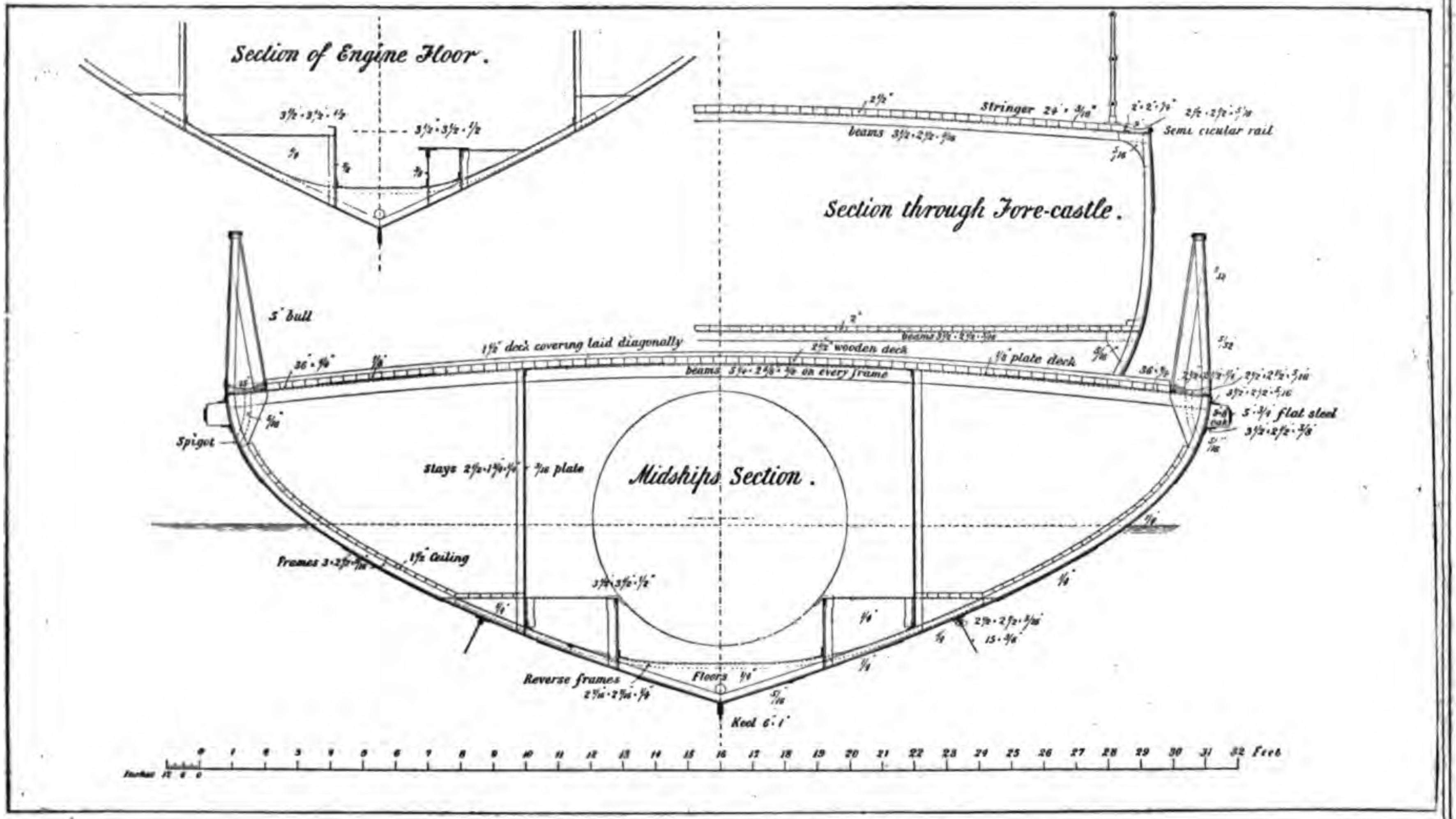
STEAM FERRY ("BELL-BROOK.")

A VESSEL of a very interesting type has lately been built by Bergsunds Mek. Werkstads Aktiebolag of Stockholm, Sweden, for the Finish Steamboat Depôt Company, St. Petersburg, and it is our pleasure to lay before our readers a description and diagrams of this vessel, which is named the *Bell-Brook*.

This vessel has been constructed and equipped for the vehicular and passenger traffic across the Harbour of Sebastopol; for which purpose it is provided with carriage-ways at each side of the main deck amidships underneath the bridge, and with saloons fore and aft for passenger accommodation. The length is 130 ft.; the breadth, moulded, 30½ ft.; and the extreme breadth of fender rail 31¾ ft.; while the depth, moulded, is 10½ ft. It is a significant fact that the vessel could not have been built any broader, otherwise she could not have passed the lock at Stockholm, between the lake Malaren and the Baltic. The illustrations which we give relating to this vessel consist of a whole plate representation. Fig. 1, an elevation in profile; Fig. 2, a part sectional plan; Fig. 3, various transverse sections of the ship; Fig. 4, diagram setting out her lines. We propose to give diagrams of the engines and boilers in our next issue. The material used in her construction is the best Siemens-Martin steel, the keel plate consists of a 6 in. by 1 in. bar-keel, and the stern-post and propeller frames are made of cast steel 6 in. by 1½ in. in sections. Two rudders are fitted, one at each end; they are made of cast steel, and are of the balanced form; they are coupled to one another, and are worked from one steering apparatus from the deck-house on the bridge. As will be seen from the drawings, the scantlings are rather light, but there are two strong girders running fore and aft, making the longitudinal strength sufficient, and further, numerous traverse bulkheads are provided. Two bilge keels 15 in. deep are fitted to the hull in order to reduce rolling. Large bunkers for coal and tanks for fresh water are built into the structure of the ship. It will be seen from the drawings that the lines of the vessel are very fine. The propelling machinery consists of two sets of boilers and engines arranged quite independent of each other, one working a screw at the fore end, and one working a screw at the after end. The object of this arrangement is to give greater safety, and reduce the risk and inconvenience in case one engine should get out of order. The engines are of the compound vertical inverted type and are capable of developing 300 I.H.P. The engines have each two cylinders 10¾ in. and 22½ in. in diameter respectively, with a length of stroke of 14½ in., the reversing gear is of the ordinary link motion type, and is adapted for operation by hand. The boilers are cylindrical in shape, of 7 ft. 10 in. diameter and 8 ft. 4 in. length. They are each fitted with two cylindrical furnaces of 30 in. diameter, and discharge their products of combustion into an independent funnel of 17 in. diameter. A trial was made before leaving Stockholm when the displacement of the vessel was 210 tons, under which load her draught was 6 ft. both fore and aft, the load including 20 tons of coal and 25 tons of fresh water; a speed of 10 knots was reached under these conditions. The voyage of the *Bell-Brook* from Stockholm to Sebastopol was interesting in its character, as it afforded a very fair test of how the vessel acted under adverse circumstances. She left Stockholm on September 5th, and encountered a very choppy sea in the southern part of the Baltic, in consequence of which she had to put into Kiel to have some rivets put in fore and aft at the portions of the hull where the waves had struck her. After leaving Kiel, she passed through the North Sea Canal and went straight on down the English Channel to Brest, where a couple of days were occupied in filling her bunkers. The passage from Brest across the Bay of Biscay was rather rough, and the captain found the only way of keeping the vessel's head to the waves, in order to prevent excessive heavy tossing and rolling, was to maintain both the engines working at full speed, although one of the screws alternately worked in the air, thus allowing the engines to race excessively. After this rather adventurous part of the voyage the *Bell-Brook* reached Gibraltar safely without any damage, on September 21st. In the Mediterranean the weather was fine, and after one call at Malta for coaling, the *Bell-Brook* arrived at Sebastopol on October 3rd. The passage across the Black Sea was also troublesome, but the captain did not mind it very much after having got over his trouble in the Bay of Biscay. This little ferry has thus made this long passage in less than a month, and when she arrived at Sebastopol she was put on duty at once, taking vehicles and passengers across the harbour. From the experience learned from the passage of the *Bell-Brook*, it will be wise in the future to avoid all flat and projecting surfaces, on which the waves could strike powerfully with a consequent risk of severely injuring the shell by the plating becoming bent in between the frames and the rivets becoming loose.

Personal.—We learn that Mr. William Isaac Taylor, M.I. Mech.E., of 50, Fenchurch Street, E.C., has been appointed as the successor to the late Mr. Archibald Thomson, to represent the Darlington Forge Co. Limited, for London and South of England, for all work of their manufacture, with the exception of railway work. Mr. Taylor has represented Messrs. Clarke, Chapman & Co., Limited of Gateshead, for the last fifteen years, this position he still retains.

The Delta Metal Co, Limited. — The 10th annual general meeting of the shareholders of the above company was held on the 18th March, at 110, Cannon Street, E.C. Mr. Chas. Cammell occupied the chair, and moved the adoption of the report and balance sheet. He stated that the company's business for 1897 had been very satisfactory, and had continued to increase; in fact, the increase had been so important, and so steady, that the directors had to take in hand the establishment of branch works, for which suitable premises were found at Airdrie, near Glasgow. Here the necessary plant, including another squeezing machine, had been laid down, and they were now just about to start those works. The unfortunate labour troubles had naturally affected their business to some extent, but notwithstanding this, they were able to propose a dividend for 1897 of 8 per cent., less income tax, and an addition of £500 to the reserve fund, after writing off nearly £1,200 for depreciation, etc. As, after the settlement of the labour dispute, trade had become very brisk and the company had now largely-increased facilities for a greater output, the directors anticipated very favourable results for the current year. The report and balance sheet were carried unanimously, and the proposed dividend of 8 per cent. declared. Mr. Chas. Cammell was re-elected a director, and Mr. Geo. Williams, auditor of the company, and the proceedings terminated with the usual vote of thanks.


Section of Engine Floor.
3½ · 3½ · ½
3½ · 3½ · ½
Section through Fore-castle.
Stringer 24" · 3/16"
2½"
beams 3½ · 2½ · 5/16
2" · 2" · ¼"
2½ · 2½ · 5/16
Semi cicular rail
5/16
2"
beams 3½ · 2½ · 5/16
½" plate deck
5/16
Midships Section.
5" bull
1½" deck covering laid diagonally
2½" wooden deck
beams 3½ · 2½ · 5/16 on every frame
36 · 5/16
36 · ⅜
2½ · 2½ · 5/16
3½ · 2½ · 5/16
5 · ¾ flat steel
oak
3½ · 2½ · ⅜
5/32
5/16
Spigot
Stays 2½ · 1¾ · ¼ · 5/16 plate
Frames 3 · 2½ · 5/16
1½" Ceiling
3½ · 3½ · ½
2½ · 2½ · 5/16
15 · ⅜
Reverse frames
2 5/16 · 2 5/16 · ¼
Floors ¼
Keel 6 · 1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 Feet
Inches 12 6 0

DOUBLE-SCREW FERRY STEAMER, "BELL-BROOK." (*Fig.* 3.)

OBITUARY.

RICHARD BARNWELL.

THE death took place, on the 8th ult., of Mr. Richard Barnwell, until recently managing director of the Fairfield Shipbuilding and Engineering Co., Limited, who succumbed to a painful illness at his residence, Elcho House, Balfour, Stirlingshire. Born at Canterbury in '49, Mr. Barnwell received his earlier commercial training in the Union Bank of London, Limited. About twenty years ago he entered the service of Messrs. John Elder & Co., of Fairfield, then under the control of the late Sir William Pearce, Bart., became a partner in 1885, and was appointed managing director when the concern was formed into the Fairfield Shipbuilding and Engineering Co., Limited, in 1886. He was a Conservative in politics and took a keen interest in the division in which the Fairfield works are situated. Although not a public man, Mr. Barnwell was widely known and respected in business circles, and in addition to his position at Fairfield was chairman of the Herne Bay Pier Co., managing partner of the Northern Pacific S.S. Co., director of the Isle of Man Steam Packet Co., director of the Liverpool and North Wales Steamship Co., and director of the Scottish Oriental Steam-ship Co. The deceased gentleman leaves a family of three sons and three daughters to mourn his loss, his wife, a step-sister of Lady Pearce, having preceded him in 1893. Mr. Barnwell's remains were interred in Craigton Cemetery, the sad ceremony being largely attended.

STEPHEN ALLEY.

THE death took place on the 23rd ult., at Langside House, Glasgow, of Mr. Stephen Alley, of the well known engineering firm of Messrs. Alley & Maclellan, Sentinel Works, Polmadie, Glasgow. For several days Mr. Alley had been slightly indisposed, but he was at business up till the 19th, after which his condition became worse, until on the 23rd he succumbed to an attack of acute pneumonia. The deceased gentleman, who was widely known in engineering circles throughout the kingdom, was a native of Dublin, where he was born about 58 years ago. When he was about 14 years of age he went to Glasgow, and commenced his apprenticeship as an engineer with Messrs. Neilson Brothers—sons of Mr. Beaumont Neilson, of hot-blast renown—at their works in Hydepark Street. Eight years later he was manager of the marine engineering and tool departments of the works, but subsequently he started as a consulting engineer in the city. About 25 years ago, in conjunction with Mr. J. A. Maclellan, he commenced engineering business under the style and title of Alley & Maclellan, Sentinel Works. The works at first were situated in London Road, but five years later the establishment was removed to Polmadie district. Here, in addition to the manufacture of "Sentinel" water valves, which formed the main speciality, other branches of manufacture were undertaken, including Westinghouse high speed engines, "Sentinel" steering gears, ash-hoists, and, more recently, feed filters, in all of which the firm now does a large business. For a time also marine engines were undertaken by the firm, and the construction of light draught steamers for shipment abroad still forms a branch of the business carried on at the Sentinel Works. Some years ago Mr. Alley, in conjunction with others, established the British Hydraulic Foundry Co., whose works are at Whiteinch, mainly for the manufacture of the cast-iron segments, now so largely used in the structure of railway and other tunnels. The Blackwall Tunnel under the Thames, and the Finnieston Tunnel under the Clyde, were wholly supplied from these works. Mr. Alley's advice and assistance were enlisted in connection with many important engineering movements in Glasgow and the West of Scotland. He was a prominent member of the Glasgow International Exhibition of 1888, and recently he was appointed convener of the Machinery Section Committee of the Great Exhibition to be held in Glasgow in 1901. In local public life he took a fairly active part, and in politics he was a Conservative. He became early associated with the Volunteer movement, and was Hon. Colonel of one of the Glasgow corps. He leaves three sons and a daughter.

COLONEL DYER.

IT is with regret that we have to announce the death of Colonel Dyer, the President of the Engineering Trades' Employers' Federation, which took place from heart disease, at his residence, Appleby Lodge, Rusholme, Manchester.

Lieut.-Colonel Henry Clement Swinnerton Dyer was born in the year 1834, of a military family. At the age of 18 he entered the Royal Artillery, and during his army career saw a good deal of active service. He took part in the siege of Sebastopol, and during the Indian Mutiny he was in many important engagements. He was present at the relief of Lucknow and the battle of Cawnpur, in which he had his horse killed under him, as he did also in the Crimea. He was mentioned many times in despatches, and retired from the army with high distinction as a soldier.

After his retirement from active service he became for some time assistant-superintendent of the Small Arms Factory at Enfield. Subsequently he migrated to the establishment of Sir Joseph Whitworth, at Manchester, where he remained for several years. In 1883 he was entrusted by Sir William Armstrong with the direction of the Steel Works at Elswick. On the amalgamation of the great concerns of Armstrong & Whitworth, Colonel Dyer became superintendent of the Manchester branch of this combination, a position he held at the time of his death. The matter, however, which brought him more prominently than anything before the public was his work in the formation and organization of the Federation of Engineering Employers.

He was the president of the Federation of North-East Coast Employers, and it was through his agency that this association was affiliated with the Scotch Association and the other bodies at different parts of the country.

Colonel Dyer was a hard fighter but eminently straightforward and invariably urbane, and his opponents will feel with his friends that the country is the poorer by his death.

DESCRIPTION OF SOME EXPERIMENTS WITH A WATER-TUBE BOILER.*

By A. F. YARROW, Esq., Vice-President.

IN this paper, which I have the pleasure to submit to the meeting, I propose to describe some experiments made last year by us with one of our water-tube boilers. The boiler selected had a grate surface of 33 square feet and a heating surface of 1,840 square feet having tubes varying from 1¼ in. to 1 in. diameter.

Diagram No. 1 gives a general idea of the boiler, which no doubt is familiar to most of you. Numerous experiments were tried with a view to test the consumption of fuel at different rates of evaporation, and to make comparison easy, the results are set out in the form of a curve, as shown on Diagram No. 2. The horizontal distances represent the amount of water evaporated per lb. of Welsh coal, and the vertical distances the amount of water evaporated per square foot of heating surface.

As the draught is forced and the evaporation more rapid, the extent to which the economy falls off is clearly seen. This mode of setting out boiler experiments renders comparison between different boilers and changes in the same boiler very apparent.

The various spots on the diagram represents different experiments, and the thick line A B shows the results obtained with the boiler as usually constructed. To the thick line is added a dotted line B C, showing further results at abnormal rates of evaporation. In these experiments the feed is passed into the boiler, mixing at once, as usual, with the water already in the boiler. After making a large number of trials with the ordinary method of feeding, we then partitioned off, as shown in Diagram 3, by diaphragms in the bottom pockets, three outer rows of tubes on each side, and we allowed the feed-water to pass in at the right-hand side of the diaphragm on the right-hand leg, and at the left-hand side of the diaphragm on the left-hand leg. The effect of this was to increase the evaporative efficiency, as indicated by curve D E. The observations upon which the curve D E is based were taken by an officer from the Controller's Department of the Admiralty.

The reason for the advantage gained a little reflection wil show. Take for example, a working pressure of 250 lbs. The corresponding temperature will be 406 deg. Fahr. Assuming that the heated gases coming in contact with the last three rows of tubes have a temperature of, say, 700 deg., there will be a difference of temperature between the heated gases and the tubes of 294 deg. Fahr. Now, if those three rows of tubes are supplied direct from the feed pump with water, say, at a mean temperature of 200 deg. Fahr., there will be a difference between the temperature of the water in those tubes and the gases coming in contact with them of 500 deg. Fahr., *i.e.*, in the latter case the difference of temperatare will approach nearly twice what it was in the former case, and, as the greater the difference of temperature between the gases and the heating surface the greater the absorption of heat, the advisability of keeping as cold as possible those surfaces which are called upon to absorb the last remnant of heat from the gases is clearly evident. The outer rows of tubes thus act, as it were, as an economiser or feed-heater of a very simple character, forming part of the boiler proper, having the advantage that, instead of being in the uptake and depending for their supply of water solely on the feed pumps (which, in case of stoppage, might result in serious damage through the surfaces becoming overheated), in the system described the tubes are dependent upon two means of supply, namely, from the feed pumps, or (in the case of the stoppage of the feed pumps) from the water in the upper chamber, which would flow down into these tubes.

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* Read at the Thirty-ninth Session of the Institution of Naval Architects March 31st, 1898.

This remarkable gain we desired to have confirmed, quite apart from our own observations, and in an altogether different manner from that in which our experiments had been tried. Professor Lambert and Mr. Haddon, of the Royal Naval College, kindly undertook to do this for us. In order to test the comparative merits of the two systems, namely, (1) feeding by the ordinary method, and (2) by passing the feed water through the three outside rows of tubes before mingling with the water in the boiler, the latter plan was adopted on the one side of the boiler, and the former plan, in which all the tubes took part in the general circulation, was carried out on the other side of the boiler, as shown in Diagram No. 4. The object in view was to ascertain the temperature of the gases immediately before they came in contact with the heating surfaces, and their temperature immediately they left the heating surfaces, the difference indicating the amount of heat absorbed; and clearly, if in one system more heat was absorbed than in another, other conditions remaining the same, that form of construction which led to the greatest absorption of heat would necessarily be the more economical.

FIG 1

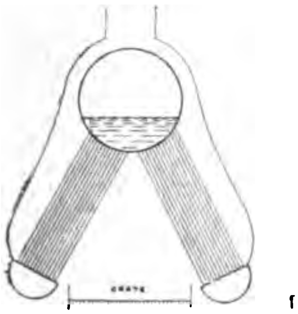
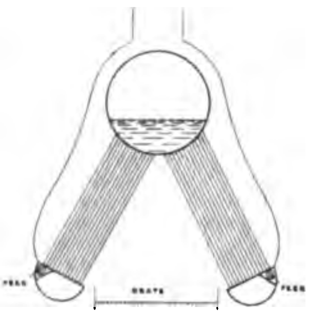


FIG 3



I cannot do better than now give an extract from the report of Professor Lambert and Mr. Haddon:—

"Temperatures were measured by a Le Chatelier platinum and platinum-rhodium couple, combined with a 'dead-beat' galvanometer, carefully calibrated. The wires from the couple were covered with asbestos thread, and cased in a 4 ft. length of ½ in. gas pipe.

"In the first and second trials observations were taken while the furnace doors were closed, three inches away from the tubes, at nine different points on each face of each group of tubes, as indicated in Diagram No. 5, holes having been cut in the boiler casing at the level of these points for the introduction of the tube containing the wires and couple.

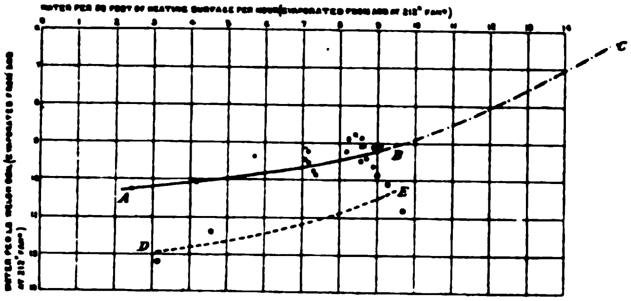
"In the first experiment a rapid rate of combustion (52 lbs. per square foot of grate) was maintained. In the second, a low rate of combustion (19 lbs. per square foot), and in this trial special care was taken to read off at each point at, as nearly as possible, the same time after stoking, and always at that set of tubes further from the door (there were two fire doors) at which stoking had last taken place, in order to lessen the large irregularities due to periodical and frequent stoking. The means of the temperatures on the four faces are indicated in the accompanying Diagram No. 4.

"In order to further eliminate the irregularities due to the varying conditions of the fire, a third trial was undertaken, in which a very long series of observations was taken at about half-minute intervals, without reference to the times of stoking, so as more nearly to correspond to actual working conditions, the temperatures being read of simultaneously by two thermo-couples fixed opposite the centres o' faces A and B, and afterwards a similar long series of observations opposite the centres of C and D. In all, over 300 records were made. The means of the temperatures thus last obtained on the fire faces are higher than those of the first two trials, as all the records were taken at the middle of the faces where the previous experiments had shown there was greatest activity. The results are recorded on the Diagram No. 4.

"*Funnel Temperatures.*—These were taken by the thermocouple at the bottom of the funnel 9 in. below the steam blast, while the doors were closed, and at different periods after stoking, and the means of several observations gave temperatures 662 deg Fahr., 433 deg. Fahr., and 608 deg. Fahr., in the first, second, and third trials respectively.

FIG 2.

SHEWING RESULTS OF EVAPORATION TESTS OF "YARROW" BOILER



NOTE. The full line has reference to a "Yarrow" Boiler with all tubes embraced in general circulation. The dotted line has reference to same "Yarrow" Boiler with 3 outer rows of tubes supplied direct from feed pump and consequently colder than under previous conditions

"*Analysis of Flue Gases.*—During the first experiment three samples were drawn from the bottom of the funnel by an aspirator, and submitted to quantitative analysis, with the following results :—

	Percentage Volumes.			
	Carbonic Acid.	Oxygen.	Carbonic Oxide.	Nitrogen & Water Vapour.
Sample A. Doors closed. One minute after stoking	10·5	9·5	0	80
Sample B. One door open. Sample taken during stoking and after	9·03	12	0	78·97
Sample C. Doors closed. Immediately after stoking	14·33	5·53	0	80·14

The absence of carbonic oxide in each case indicates that the combustion was perfect.

"Sample A showed that 54·8 per cent. of the total oxygen admitted had been utilised.

"Sample B, *with open door,* showed, of course, at less proportion of oxygen utilised, viz., 45·5 per cent.

"Sample C, taken with doors closed, and immediately after stoking, gave a higher proportion of oxygen utilised, or 73·1 per cent., apparently indicating, to a certain extent, a higher efficiency than when sample A was taken, after the doors had been closed for one minute."

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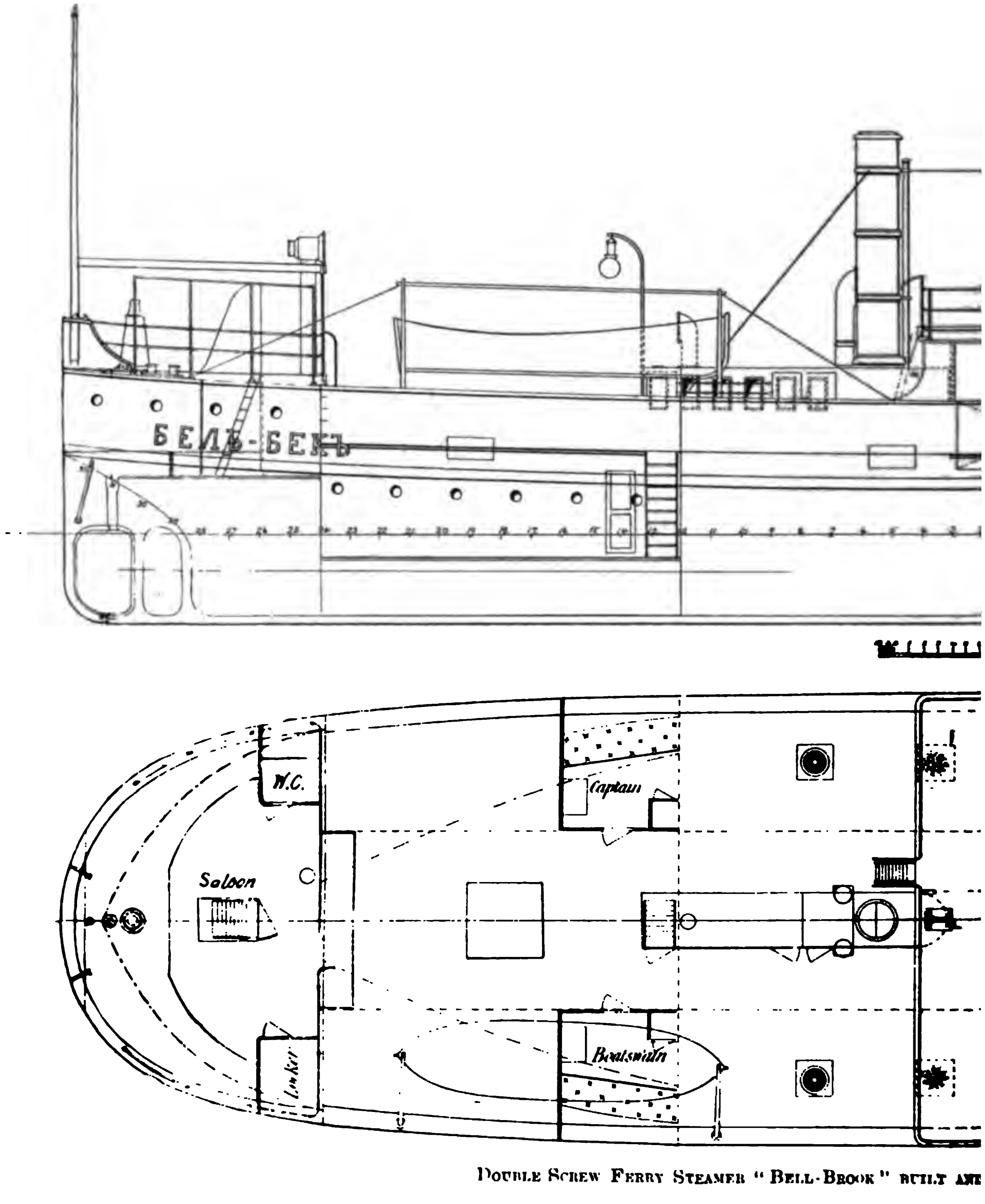
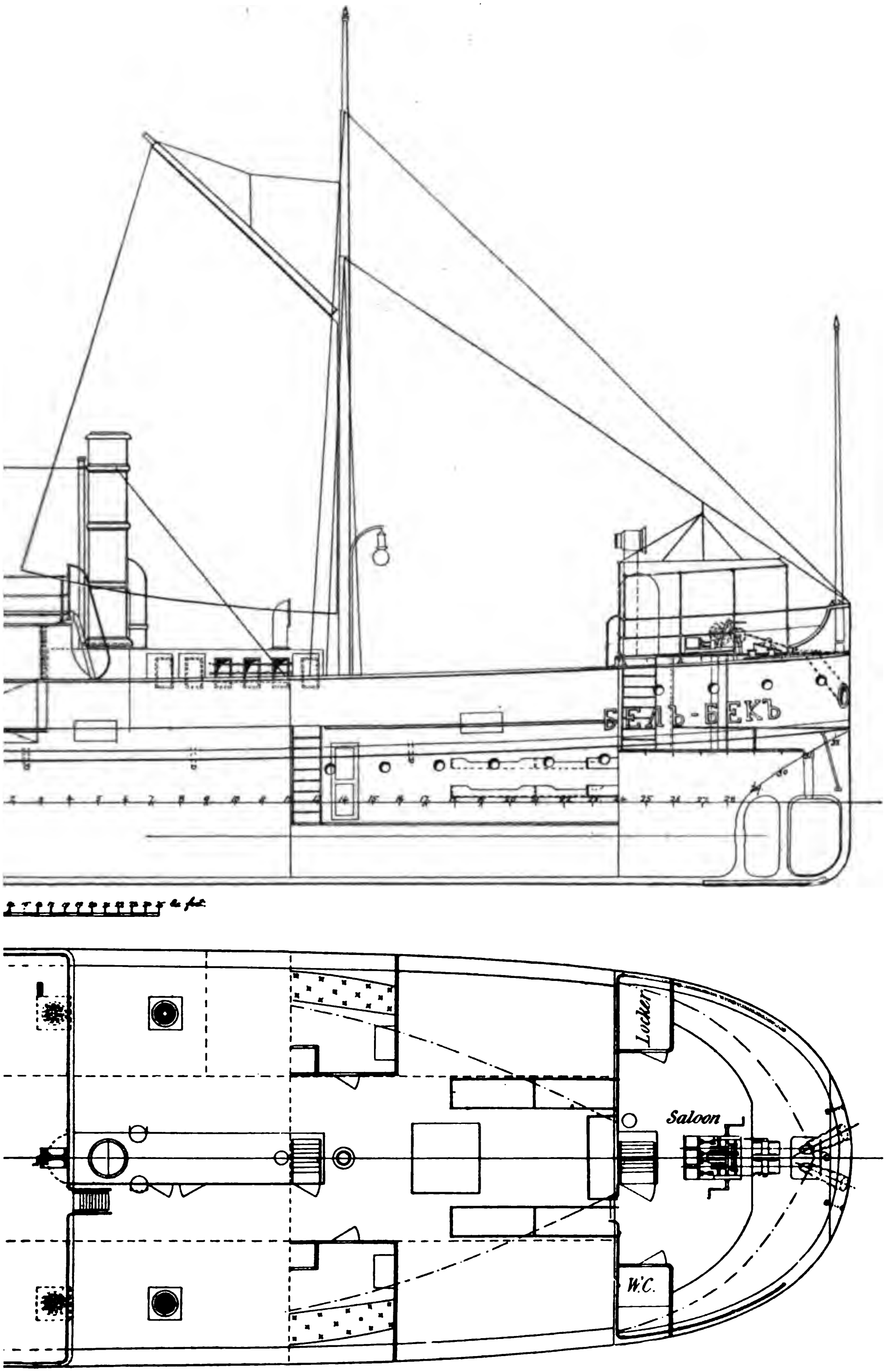

БЕЛЬ-БЕКЪ
W.C.
Saloon
Captain
Boatswain
Locker

Double Screw Ferry Steamer "Bell-Brook" built an

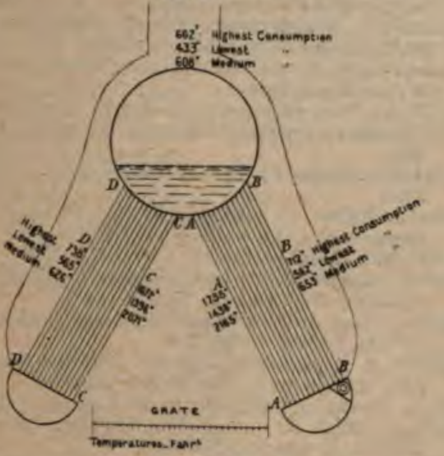

БЕЛЪ-БЕКЪ
ft.
Locker
Saloon
W.C.

Bergsunds Mek. Werkstads Aktiebolag, Stockholm.

General Remarks.

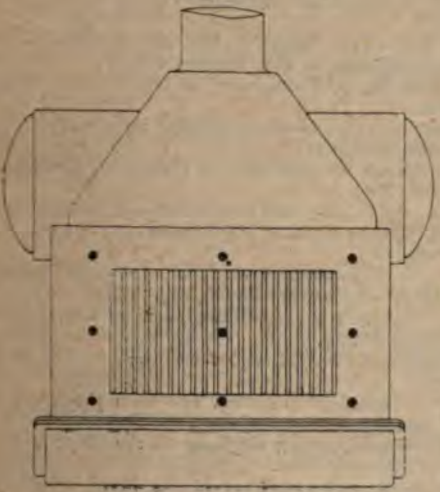
The highest temperature recorded was 2,282 deg. Fahr. in the first trial. The difference between the mean temperatures on inner and outer faces of the tubes was in each case greater on the side in which the outer rows of tubes were only supplied with water direct from the feed pump, the difference in favour of this system being 89 deg. in the experiment with rapid combustion; 45 deg. Fahr. in the case of slow combustion, and 67 deg. in the medium case. These results clearly point consistently to the advantage of the new feed system and towards confirming the previous experiments as indicated by curves A B and D E, Diagram No. 2.

FIG 4



Trial No.	Pressure in lbs □"	Consump per sq ft of grate	Feed side face A / face B	Other side face C / face D	Excess diff in favour of feed side	Funnel temp. (Fahr)
I	180	52 lbs	Fahr 1735° 712° Diff = 1023°	1672° 738° Diff = 934°	(Fahr) 89°	662°
II	180	19 lbs	1438° 562° Diff = 876°	1396° 565° Diff = 831°	45°	433°
III	180	31.4 lbs	2165° 653° Diff = 1512°	2071° 626° Diff = 1445°	67°	608°

FIG 5



In connection with this subject, attention may be drawn to the fact that whatever gain there may be by the system described in this paper, it will increase as the working pressures, and consequently the temperatures of the water, rise. During these experiments the varying efficiencies of the different systems of stoking were most apparent.

The object, of course, is to secure complete combustion and entire absence of carbonic oxide in the flue gases, and to secure this with a minimum admission of air, the heating of any excess of air representing loss in economy. There are devices for continuously recording, in the case of stationary boilers, the specific gravity of the flue gases, which serve to indicate if there be present carbonic oxide or unconsumed air, and I am told, on the best authority, in works, where such a device is in daily use and the stoking guided by it, a marked economy has been the result. I would submit that if a device of this kind could be designed so as to render it applicable for use on board ship it would serve as a guide for efficient stoking.

Catalogues.—We have received two catalogues from Messrs. Geo. Richards & Co., Limited, of Broadheath, near Manchester, one illustrating wood working machinery and the other machine tools in great variety. The various machines are very well illustrated and a comprehensive description deals with each tool. There are a large number of very ingenious labour-saving devices included in these catalogues for both wood and metal work, and the contents of these publications afford very good evidence that the British tool maker is not so far behind his competitors as many people would have us believe.

Valve Models.—A very useful series of valve models has been devised and published by Mr. A. R. Leask, of 95, Minories, London. These models are made of cardboard with moveable valves, and the port diagrams are combined with a chart showing the paths of the crank and eccentric; the periods of admission, expansion, exhaust, and compression being clearly indicated by different colours, as also is the inside and outside lap on the valve. These devices are suitable for illustrating the motion of a simple, compound, triple, quadruple, or other expansion engine if one or more of the four valves contained in the set are used in the engine, the models at one glance showing the positions of the crank, eccentric, valve, and piston, and corresponding position on the indicator card at one and the same instant. The amount of travel, width of steam and exhaust opening, and action of steam and exhaust lap, are also clearly shown. In addition to the models, a pamphlet is included containing full explanations and instructions as to how the models are worked; each set being contained in an extremely neat cloth case, and the whole is well worth the low price of 1s. 6d., at which they are issued. It is an interesting fact that these models have already been adopted by one of the engineering colleges, and we understand that they are likely to be taken up by several others. In addition to affording numerous exercises in slide valves, instruction in the various points on an indicator is also readily given.

Windward.—The Arctic expedition projected by the American people will be assisted by English enterprise and generous support. The yacht *Windward* has been presented by her owner, Mr. Harmsworth, to Lieut. Peary for the purpose of being included in the expedition which will leave New York in April. This vessel, which was laid up in the St. Catherine's Dock London, last October, has been refitted and the machinery put through extensive repair and alteration under the orders of the owner, who instructed Messrs. Flannery, Baggallay & Johnson to take such steps as were best for improving her speed and increasing the power of the machinery. During the last three months the work has been carried on under some difficulty and delay owing to the late engineers' dispute. The old boiler has been removed, and a fresh boiler of considerably larger power and pressure has been fitted, the engines completely overhauled, renovated and tested, and various additions made throughout for the purpose of obtaining higher power. New propeller of Phosphor bronze and of increased driving power has been fitted, and all being complete, engines have been turned, and vessel was taken down the Thames for final trial on March 15th. The machinery worked throughout without the slightest hitch and developed a very largely increased power, driving the ship according to estimated figures about 1⅜ knots faster than before, which results were very satisfactory to the owner's representative on board. The hull has been thoroughly overhauled from stem to stern, the larger part of the rigging and sails have been renewed, new structure has been fitted in parts, and various compensations and strengthenings have been introduced. The cabin and accommodation have been renovated and put into good order before the ship's departure for New York, whence she will sail from the Thames in the course of two or three days after getting her stores and coals on board.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from February 23rd to March 24th, 1898:—

A'Court, John, fleet engineer to the *Abyssinia*, to date February 22nd.

Adams, William H., chief engineer to the *Victory*, additional, for the *Naiad*, to date March 3rd.

Anstey, W. J., chief engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Arthur, John F., engineer to the *Terrible*, to date March 24th.

Attwool, George, engineer to the *Mermaid*, undated.

Bain, David H. W., assistant engineer (temporary) to the *Terrible*, to date March 24th.

Barry, G. W., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Basson, Harry, engineer to the *Seal*, undated.

Bearblock, Charles W. J., engineer to the *President*, additional, for service at the Admiralty.

Bearblock, Charles W. J., engineer to R.N. College, to date March 7th.

Benn, Edward P. St. J., assistant engineer to the *Bonaventure*, to date March 3rd.

Bennett, James M. C., fleet engineer to the *Mars*, to date March 3rd.

Bennington, John W., fleet engineer to the *Hermione*, to date April 7th.

Bills, William H. T., fleet engineer to the *Orion*, to date February 21st.

Brown, Arthur, assistant engineer to the *Gossamer*, to date March 15th.

Brown, William J., staff engineer to the *Pembroke*, additional, for the *Andromache*, to date March 3rd.

Burner, W. H., fleet engineer to the *Raleigh*, additional, to date March 11th.

Burnes, T., fleet engineer, has been placed on the Retired List of his rank.

Burnett, W. C., chief engineer to the *Vivid*, additional, for the *Hyacinth*, to date March 16th.

Bushby, J. F., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Callaway, Richard G., fleet engineer to the *Victory*, additional, to date March 11th.

Cockey, G. H., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Coomber, Thomas G., fleet engineer to the *Pembroke*, additional, for the *Warspite*, to date March 5th.

Cutlack, Percy E. (probationary), assistant engineer to the *Sirius*, to date February 28th.

Dalrymple, J. H., engineer, has been promoted to the rank of chief engineer, in Her Majesty's fleet.

Davies, William R., engineer to the *Victory*, additional, for the *Starfish*, undated.

Donkin, C. F. L., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Dunn, Charles F., engineer to the *Vivid*, to date February 21st.

Emdin, Archie R., engineer to the *Pelorus*, to date March 16th.

Evans, Alfred, assistant engineer to the *Sharpshooter*, to date March 24th.

Ford, Francis, fleet engineer to the *Centurion*, to date March 5th.

Fraser, George J., fleet engineer to the *Inflexible*, to date February 21st.

Goodwin, George G., staff engineer to the *President*, additional, for service at the Admiralty, to date March 7th.

Gregory, Charles W., staff engineer to Devonport Dockyard, to date March 7th.

Hammond, Cyril E. J., acting engineer (probationary), to the *Hermione*, to date April 7th.

Hefford, Edward O., engineer to the *Vulcan*, to date March 16th.

Herbert, R. K., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Heyes, Henry W., engineer to the *Collingwood*, to date March 14th.

James, William H., engineer to the *Halcyon*, to date March 15th.

Jameson, Thomas O., engineer to the *Terrible*, to date March 24th.

Johnson, John R. D., fleet engineer to the *Polyphemus*, to date March 14th.

Jones, Richard W., chief engineer to the *Marathon*, to date February 21st.

Kelly, Frederick, assistant engineer to the *Howe*, to date March 24th.

Lecky, Charles B., engineer to the *Spider*, undated.

Leighton, W. J., acting engineer, has been confirmed in the rank of engineer in Her Majesty's fleet.

Marshall, Ernest H., acting engineer (probably) to the *Polyphemus*, to date February 22nd.

Marrack, P., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Massey, Josiah S., assistant engineer (temporary) to the *Terrible*, to date March 24th.

McLaurin, John, engineer to the *President*, additional, for R.N. College, as assistant instructor in steam, to date March 16th.

Meiklejohn, Henry J., engineer to the *Quail*, to date February 28th.

Mitchell, Walter F., engineer to the *Hibernia*, additional, as instructor in the working of machinery of torpedo-boats, to date March 14th.

Moffett, Edward G. P., staff engineer to the *Pembroke*, additional for the *Hydra*, to date March 5th.

Moore, Albert J. C. (probationary), assistant engineer to the *Rodney*, to date March 3rd.

Morison, R. B., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Morris, Thomas C., engineer to the *Express*, to date March 7th.

Murray, Alfred E. J., assistant engineer (temporary) to the *Terrible*, to date March 24th.

Nicholls, Harry E., assistant engineer to the *Halcyon*, to date March 15th.

North, Caleb J., fleet engineer to the *Pembroke*, additional, as engineer overseer at the works of Messrs. J. & G. Thomson, Clydebank, and to assist in the general overseeing work of the Clyde district, to date March 5th.

Owen, John A., assistant engineer (temporary) to the *Bonaventure*, to date March 3rd.

Page, Gilbert H., assistant engineer to the *Charybdis*, to date March 16th.

Pover, W. T., fleet engineer, has been placed on the Retired List, with permission to assume the rank of inspector of machinery.

Pratt, W. H., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Ramsay, George, chief engineer to the *Inconstant*, to date March 11th.

Raper, R. St. John, engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Rees, John S., staff engineer to the *Terrible*, to date March 24th.

Robertson, Gordon, assistant engineer (temporary) to the *Terrible*, to date March 24th.

Roome, George W., engineer to Devonport Dockyard, to date March 7th.

Rush, Henry C., engineer to the *Terrible*, to date March 24th.

Screech, Samuel A., chief engineer to the *Mercury*, to date February 21st.

Skelton, R. W., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Smith, Frederick P., chief engineer to the *Bonaventure*, on commissioning.

Sparks, Ernest F., chief engineer to the *Philomel*, to date March 10th.

Spence, R., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Stocker, Ernest, acting engineer to the *Rupert*, additional, to date February 22nd.

Stuart, Marlin, chief engineer to the *Vivid*, additional, for the *Gorgon*, to date February 19th.

Taylor, Charles G., engineer to the *Renown*, additional, to date February 28th.

Ter Veen, Vernon A. A., acting engineer to the *Pigeon*, undated.

Tilbrook, C. F. H., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Turner, Arthur W., staff engineer to the *Argonaut*, to date January 31st.

Walker, John R., naval instructor to R. N. College, to date January 31st.

Wallis, H., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Watch, Harold V. K. (probationary), assistant engineer to the *Blake*, to date March 16th.

Watts, James A., probationery assistant engineer to the *Thetis*, to date February 15th.

Waud, Edward V., assistant engineer to the *Porpoise*, to date February 4th.

Webber, James C. N., acting engineer (probationary), to the *Hermione*, to date April 17th.

Wells, F. W., staff engineer to the *Medusa*, to date January 29th.

White, A. F., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Wisnom, William McK., engineer to the *President*, additional, for service at the Admiralty.

Wormald, G., assistant engineer, has been promoted to be acting engineer in Her Majesty's fleet.

HOAR & BROWN'S HARDWOOD MARKET REPORT, MARCH 24th. 1898.

TEAK.	Timber. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, Mar. 1st	12,097	3,255	20	15,372
Landings	10	280	—	290
	12,107	3,535	20	15,662
Deliveries	311	198	—	509
Stock, Mar. 18th	11,796	3,337	20	15,153

The deliveries up to date this year have been satisfactory, and in excess of those for the same period in 1897. The stock appears large, but considering the demand is fairly good for first-class timber, the requirements for this quality will fully exhaust the present available landings, the stock largely consisting of what may be termed second-hand wood. Floating prices are high, and the tonnage coming forward is light, consequently the prospect is in favour of a continuation of firm prices. The importation of planks continues brisk, and a tendency is shown towards shipping an inferior quality, but as shippers of this class are known their goods are discounted accordingly. The prime class of shipments are realizing full values, and future arrivals are likely to strengthen prices.

MAHOGANY.—The public sales have been heavy, especially for Honduras and African, the smaller wood suffering with regard to price. A still further reduction in values for this class is expected to take place owing to arrivals of large quantities which must come on the market.

Nicaraguan is finding much favour, and parcels are passing into consumption direct from the ship's side.

Minatitlan.—There is not much demand, and only large sound wood sells readily at good prices.

Panama—This is arriving in such a defective condition there is great difficulty in placing shipments. The stock is considerable, and very low prices will have to be accepted.

African.—The importations have somewhat fallen off, and the tone of the market is slightly firmer.

Cuba.—Prices remain high, and unsold stock is restricted to a few logs only. The actual stock in docks is 2,000 logs.

Tobasco.—Until lately the stocks have gone well, but with the low figures realized for other classes it is expected that this wood must suffer with the rest.

CEDAR.—A steady market is ruling, with light supplies; there is no improvement with Paraguay, and further stock would do badly.

WALNUT.—Large good logs sell well, and the demand continues. Planks and Boards. Some cheap parcels have changed hands lately, and the minimum has no doubt been reached. Prime boards and planks are scarce, and the demand is good.

AMERICAN WHITEWOOD.—Business is fair at the low prices ruling. Large parcels are offering at the minimum figures.

SEQUOIA.—The stock is much easier, and sales have been made at increased rates.

KAWRIE PINE.—Planks. Sales continue to be made with good results, and there is a tendency to a rise in values. Logs are very slow of sale.

JARRAH.—The demand is increasing, and prices keep up.

GREENHEART.—The trade in this is very quiet, and prices firm.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

THE expectation that the termination of the engineering strike would be followed by a great burst of activity in the shipbuilding and engineering trades has been fully realised on the Clyde, in common doubtless with other centres. Naturally, there has been some delay in getting into full operation again in establishments which had become disorganised by the seven months' stoppage; but double shifts are now the rule rather than the exception in the marine engine shops. Clyde shipbuilders are so well booked that many of them are "full up" for the next twelve months. Notwithstanding the enormous amount of tonnage already booked, orders continue to flow in daily. The contracts placed during the month aggregate a very large quantity of tonnage, and as there are other important contracts still to be given out, as well as a very considerable amount of Government work—in all of which the Clyde yards are bound to largely share—it may be said that the iron, steel, and shipbuilding trades have rarely had such a brilliant prospect before them.

Having regard to this prospective demand for raw and finished material for shipbuilding purposes, it is not to be wondered at that the productive capacity of the Scotch furnaces is stretched to its fullest to meet the thousands of consumers. Steelmakers are likewise exceedingly busy, and report a strong demand from merchants for prompt delivery, which they can but rarely promise. Makers are readily obtaining £5 10s., less 5 per cent., for steel plates, and in some cases 2s. 6d. per ton more has been paid. It is quite possible that an official advance of another 2s. 6d. to 5s. per ton may be announced any day. The price of marine boiler plates has just been advanced 5s. a ton, not so entirely due to demand, as following upon the rise which has taken place in the price of the raw material. Producers have not for years been in such a strong position, and they are naturally rather indifferent about booking fresh contracts at present rates.

The London and Glasgow Engineering and Shipbuilding Co., Govan, have received an order from Messrs. Donaldson Brothers, of Glasgow, to build a steel steamer for their Canadian service to carry over 7,000 tons deadweight. She will be fitted with triple-expansion engines by the builders to drive her at a speed of over 12 knots. The vessel will be fitted with Howden's system of forced draught, Weir's pumps, feed-heater, and evaporator, Napier's windlass and capstan on forecastle head, and Messrs. Caldwell & Co.'s steering gear. Ten large winches will also be supplied, fitted on raised platforms, leaving the deck free for the carriage of live stock. Accommodation for the captain, officers, and all the crew, cattlemen, and horse attendants will be provided on the bridge deck. This is a feature which has been found eminently suited for the general working of such a ship. This order, it is understood, is the first of several large steamers which will be built for Messrs. Donaldson Brothers' Canadian trade.

Messrs. A. & J. Inglis, engineers and shipbuilders, Pointhouse, have been entrusted by the North British and Caledonian Railway Co.'s with the contract for the two Loch Lomond passenger paddle-steamers, about which the marine superintendents of the respective companies have for some time been at variance. The vessels, which are to be 165 ft. long, will be practically duplicates of the passenger steamer *Empress*, at present on the Loch, but with 1 foot more beam. They will not be available, however, this season. It will be well into the summer before they are launched, and during the winter advantage will be taken of every flood to get them up the river Leven to Loch Lomond.

A shipbuilding firm in the upper reaches of the Clyde have contracted to build for the New Zealand Shipping Co., Limited, a large steel screw steamer of 430 ft. in length, which will be classed with the British Corporation for the Survey and Registry of Shipping.

Messrs. Alex. Stephen & Sons, of Linthouse, have contracted with Messrs. James and Alexander Allan, of Glasgow and Liverpool (Allan Line), to construct for them a large and powerful twin-screw steamer for their Canadian passenger and cattle trade. The new vessel will be 500 ft. in length, 59 ft. beam, with a gross register tonnage of 10,000 tons. A similar vessel has been placed, as afterwards noticed, with Messrs. Denny & Brothers, Dumbarton. The Allan Line, it may be stated, have also just ordered a steamer of 420 ft. in length for their River Plate trade, from Messrs. Workman, Clark & Co., Belfast.

Messrs. Fleming & Ferguson, Limited, of Paisley, have received an order for two powerful self-propelling bucket-ladder dredgers for the Japanese Government, to be used in connection with improvements now being carried out at Nagasaki Harbour.

Messrs. William Denny & Bros., Dumbarton, are laying down a new passenger and cargo steamer to the order of the Union Steamship Co., of New Zealand, and have work advanced on two large cargo-carrying steamers for the British India Steam Navigation Co. This company, it may be added, have at present under construction in Clyde yards as many as six vessels, each of 8,000 tons deadweight capacity, or an aggregate of 48,000 tons. More orders are likely to be placed shortly. Messrs. Denny have also been entrusted by the Allan Line Co. with the building of a large and powerful twin-screw steamer for the Canadian passenger and cattle trade, similar to the 10,000 tonner ordered by the same company from Messrs. Alex. Stephen & Sons. These vessels will be built under the special survey and take the classification of the British Corporation Registry of Shipping.

Messrs. Caird & Co., Greenock, have contracted with the P. and O. Co. to build for their Australian and Indian trade two steamers, each of 6,000 tons gross, somewhat larger but similar in general design to the company's steamer, *Malta*, built three years ago. The vessels are to be provided with superior accommodation for first and second-class passengers, lighted throughout by electricity, and fitted with all the latest appliances for working cargo.

Messrs. Scott & Co., Greenock, have booked an order from the Ocean Steamship Co., of Liverpool, for a cargo steamer of 7,000 tons gross, with engines of 4,500 I.H.P., practically a duplicate of a vessel presently on the stocks for the same company.

Messrs. Carmichael, McLean & Co., Greenock, have booked a contract for a steamer of 4,000 tons gross to the order of the Stoomvart Maatschappij, Nederland.

Messrs. Robert Duncan & Co., shipbuilders, Port-Glasgow, have undertaken to build a large cargo steamer for Messrs. Raeburn & Verel, Glasgow, the engines for which will be supplied by a Glasgow firm.

Messrs. Ramage & Ferguson, engineers and shipbuilders, Leith, have at present on their stocks a vessel of 340 ft. in length to the order of Swedish owners, which is the largest steamer ever built at Leith. On the approaching expiry of the present lease of their premises from the Dock Commissioners the firm are arranging to have a portion of the foreshore reclaimed, whereby they will be enabled to extend their building lengths, so as to be able to lay down and launch vessels up to 600 ft. in length. The firm have it in contemplation, also, to introduce the system of electro-motor driving for the various isolated machine tools throughout their works.

Messrs. John Scott & Sons, Kinghorn, have secured an order for a couple of twin-screw ferry steamers for the Mersey Harbour Board.

The Admiralty on the 23rd ult. gave out the contracts which were pending, and as was hoped and anticipated on the Clyde, builders there have been allotted a good share. Of the four armoured cruisers of the *Cressy* class, no fewer than three have come to the Scottish river—one to the Fairfield Co., one to the Clydebank Co., and a third to Messrs. Scott & Co., Greenock. Over and above this the contract for the machinery of a battleship of the *Formidable* type has also come to Fairfield.

One or more of the Clyde shipbuilders—certainly the firm of Messrs. A. & J. Inglis, Pointhouse, who built the steamship *Bruce* last year for the service connecting the Newfoundland Railway with the Canadian Railway at Sydney, Cape Breton—will shortly be requisitioned to build as many as seven new steamers for Mr. Reid, the owner of the *Bruce*, who has just completed the purchase from the Newfoundland Government of the St. John's dry dock, the Colonial Telegraph and Railway System, &c. This information comes from an American shipbuilder who had approached Mr. Reid with a view to tendering for the construction of vessels, and was informed that they would necessarily have to be under the British flag, being intended wholly for the Newfoundland and Labrador Coastal Service.

Messrs. McDonald Glasgow, received an order during the month from Mr. R. S. Gilmour, Greenock, to build a steam yacht 65 ft. in length, 10 ft. 6 in. beam, and 6 ft. depth. The promenade will be 44 ft. in length and be furnished with two large cabins and a stateroom. Messrs. McKie & Baxter, Govan, will supply the engines, and the speed is to be 10½ knots.

Messrs. J. N. Lambie & Sons, steam yacht, launch, and boat builders, Ashfield Sawmills, Greenock, have contracted to build a large steam launch of naval type to the order of Sir William Armstrong, Whitworth & Co., for the Russian Government. The engines will be supplied by Mr. R. Montgomery, Greenock, and will be of superior finish, with a return tubular boiler.

The Ailsa Shipbuilding Co., of Troon, have been entrusted by Mr. G. L. Watson, Glasgow, with the building of a handsome steam yacht of about 650 tons.

At Irvine the Harbour Commissioners are now making considerable extensions to the wharfage of the port, and they have accepted the offer of Messrs. Cowans, Sheldon & Co., of Carlisle, to supply a large steam crane, the cost of which will be over £2,300.

The Ardrossan Harbour Co., a number of years ago provided a dock capable of accommodating almost the largest class of vessels, and this has been followed by a greater success even than was anticipated in the matter of attracting steamers of large tonnage. A few weeks ago, for example, there were no fewer than 21 vessels in the harbour at one time, many of which were of large size. The Harbour Co. have now had built by Messrs. Rodger & Co., Port-Glasgow, a powerful tug of the twin-screw type, engined by Messrs. Ross & Duncan, of Govan, with which they will no doubt prove to shipowners more than ever that they are able to deal with the largest class of vessels.

At Aberdeen the three shipbuilding firms established there have been entrusted with orders for the construction of a large number of steam trawlers. Altogether no fewer than 37 vessels, representing a capital of about £160,000, have been ordered. Most of the vessels are for southern owners, and several are to foreign account. Messrs. Hall, Russell & Co. launched about mid-month, two vessels of this type, 120 ft. in length, to the order of Mr. Thomas Devlin, jun., of Newhaven.

It was officially announced during the month that the directors of Messrs. A. & J. Stewart & Clydesdale, Limited, the well-known tube-making concern of Glasgow, had concluded an agreement for the purchase of the similar and equally well-known business of Messrs. James Menzies & Co., of Phœnix Tube Works, Glasgow, and the shareholders have been called together to deal with this absorption. This announcement has brought out an important fact in the recent history of the tube trade. Messrs. Menzies are still the only firm in Glasgow making cold-drawn seamless steel tubes, such as are now in so much request by our Admiralty and their outside contractors, for water-tube boilers. They laid down, some time ago, splendid new plant for the purpose of utilising the hollow steel bloom of Swedish manufacture, but subsequently the Admiralty enforced the condition that the tubes used in the Belleville boilers must be made of British steel, a condition which is without doubt good for home trade. Not to be behindhand, however, Messrs. Menzies & Co. started a short while since to lay down additional plant in order to make hollow blooms of British steel, and they had for a time to give up taking Admiralty contracts, but in the course of a month or two their new plant will be in thorough working order, when their works will, it is believed, be one of the finest in the kingdom for the manufacture of cold-drawn seamless steel tubes to meet the Admiralty requirements.

The Victoria Iron and Steel Co., Limited, a recently-formed syndicate of capitalists, have leased from the Caledonian Railway Co. a site of some twelve acres of ground adjacent to the company's station at Calder, and thereupon they are about to lay down extensive malleable iron works; a commencement, in fact, having already been made. Later on steel-making plant may also be added. Mr. David Home Morton, consulting engineer, of Glasgow, has been commissioned to design and lay down in the works all necessary plant of the most modern description with a view to securing the greatest possible economy in production. Mr. William Neville has been appointed manager to the company.

The works of Messrs. Mavor & Coulson, Limited, electrical engineers, 47, King Street, Bridgeton, have been recently extended by the addition of a new factory for their specialties in electrical machinery and accessories. The works now consist of machine shop, smithy and boiler-house, brass shop, pattern shop, carpenters' shop, winding shop, and brass foundry. The machine shop is the more important section of the works, as in it are fitted all the machine tools, as also the steam boilers, engines, and dynamos for the production of the current to light the works. This shop is 160 ft. long, 75 ft. wide, and has a single span steel roof borne on 14-in. brick walls, into which are set cast-iron columns 40 ft. apart, carrying the travelling crane. The crane is an electric one, capable of lifting ten tons, and of traversing the length of the shop in one minute. The feature of the machine shop, however, is the fact of having the tools driven by electric motors, ten of which are distributed throughout the department driving a variety of tools large and small. There are in all 15 motors, aggregating 85 H.P., and the whole of the distribution is carried out on the company's "C.C." system of concentric wiring. For the lighting of the works and offices there is an installation of 230 16-candle-power lamps, 30 sunbeam 150-candle-power lamps, and 6 arc lamps of 2,000 candle-power each. The company consider there is a promising field for their products—all kinds of electric plant—in and around Glasgow. The existence of such a well-equipped electrical factory in Glasgow will doubtless give an important stimulus to the adoption of electrical plant in Scottish industries.

Negotiations which have been in progress for some months past with the view of establishing works at Greenock for the rolling of aluminium, have at last resulted in an understanding between the Aluminium Co., and the Greenock Water Trustees, with regard to the supply of water for driving purposes. The company have had the choice of several eligible sites and one has been fixed upon in near proximity to the carbon-making works already established in Greenock, and worked in connection with the aluminium manufacture at the Falls of Foyers, of which the projected aluminium rolling works is another offshoot. Mr. R. W. Wallace, chairman of the British Aluminium Co., read a paper recently before the Society of Chemical Industry, Glasgow, on "Electrical Industries at Foyers." He gave a minute and highly-technical account of the manufacture of alumina and aluminium, going extensively into the chemistry of the various processes. With the aid of numerous specimens and lantern illustrations, he practically traced the manufacture from the original baulite to the finished aluminium, and gave a general account of the arrange- of the works at Larne, Foyers, and Greenock. The facts quoted about the electric conductivity of aluminium and its strength were of considerable interest. The conclusion reached as regards the latter point was that, weight for weight, pure aluminium is of about the same strength as steel, while some of its alloys are stronger.

In the course of the present month some time, or early in May, Glasgow's new graving dock will be actually used for the first time, and the occasion will be marked by becoming ceremony. The caisson at the entrance and the dividing gates about the middle of the dock have now been made tight, and the piling and banking at the entrance has been all but cleared away. For some time past the dock has been practically finished and has only been waiting the erection of the pumping machinery and other mechanical accessories to make it thoroughly complete. The pumping installation here, it is understood, is the largest as yet laid down in connection with docks anywhere. The body of the dock is 880 ft. in length by 115 ft. wide at top, and 81 ft. 8 in. at bottom, and when filled to a depth of 28½ ft., as will be the case with spring tides, the total capacity will be about 2,202,000 cubic feet, corresponding to about 13,762,500 gallons, or about 61,500 tons of water. The emptying of this immense body of water will be accomplished in two hours. This duty, however, the plant may not often be called upon to perform, the dock being divided in its length by the gates already referred to. These will lock a ship 420 ft. long into the inner compartment, leaving the outer free for the use of a 460 ft. ship, which, of course, can be locked in or out by the ordinary caisson gates at the entrance, independently of the inner compartment and without disturbing the ship there. Up to the present the Glasgow Dock is the longest in existence, though apparently, it will not be long permitted to hold that distinction, as the projected dock improvement scheme at Liverpool includes a graving dock 900 ft. in length, or 20 ft. longer than that at Glasgow.

The proposed scheme for forming a dock at Renfrew, on the Clyde—in connection with which a Bill is being promoted in Parliament—is likely to prove the unlooked-for lever by which the trustees of the river Cart—which joins the Clyde a short distance below Renfrew—will shift their responsibilities and chronic difficulties on to the strong shoulders of the Clyde trustees. The latter body recently approached the Cart navigation trustees, asking their co-operation in resisting the Renfrew Dock scheme. It has been considered that, should this scheme be carried into effect, it will seriously and injuriously affect the Cart Trust affairs, and those of Paisley—to which the Cart forms the water highway—and damage to a considerable extent the interests of the bondholders. As the result of conferences which have taken place between representatives of both bodies, it is understood that negotiations have been positively entered upon whereby it is possible that the Clyde Trust may take over the river Cart affairs, developing the traffic, improving the river, and generally working it as a going concern. Should the negotiations be brought to a successful issue, the outcome will be of far-reaching benefit, not only to the community of Paisley as a whole, but to the many individuals and friendly societies whose money has been invested in the concern. The first sod of the new harbour works on the Cart was cut on February 31st, 1887, and the subsequent operations in forming the harbour with its substantial quays, and in deepening the Cart from the Clyde inwards, cost £120,000, and the difficulties of the trustees may be gauged from the fact that, even now, the interest due to bondholders is £15,000 behind. The guarantee rate under the Improvement Act, which Paisley has to pay annually, is 3d. per £, but the bondholders in the present state of affairs have little prospect of a return of their capital at the end of the 30 years' period. Should the Clyde Trust take over the concern, it is believed that that matter would be adjusted satisfactorily for the bondholders. The proposal is favourably entertained by a majority of the Cart Trustees, and it is not anticipated that under the circumstances any serious opposition will be offered by ratepayers on the ground that the Trustees are not entitled to dispose of the community's interests in perpetuity. One important obstacle to the development of traffic on the Cart is the narrow channel at Inchinnan Swing Bridge, and the Clyde Trustees would have to face the removal of this structure, the widening of the river at this point, and the erection of a new bridge. This, however, would not be regarded as anything at all formidable to such an enterprising and capable body, while it is also recognised that they could in a comparatively short time, by means of their extensive dredging plant deepen the channel of the Cart, from the Clyde to the harbour at Paisley, to admit the passage of larger craft than has been possible under the present management.

The work of dock construction at Leith is being busily prosecuted and in the course of two years or so a new dock of about ten acres in area will be open for traffic. The largest of the graving docks—the Prince of Wales dock—is not to be enlarged meantime as was recently intended by the Commissioners. The intention now is to construct an entirely new graving dock capable of accommodating the larger size of vessels frequenting the port, and likely to grow in size as in numbers as time goes on. The Prince of Wales dock has a length of 382 ft.; a width of entrance of 70 ft., and depth over sill of 20 ft. at ordinary spring tides. Mr. Peter Whyte, the engineer to the Dock Commission, has prepared plans of a new dock 460 ft. in length, and so arranged that it may be lengthened to 600 ft. at any time in the future. The width will be 100 ft. at the top and 76 ft. at the bottom, a width of entrance of 70 ft. and a depth on a sill of 23 ft. at ordinary spring tides. The estimated cost of the new dock is £68,000.

"Auxiliary Machinery for Steamships" formed the subject of a paper read before the Glasgow Techinal College Scientific Society, about mid-month, by Mr. John Thom, consulting engineer, Glasgow, who dealt chiefly with the pumping arrangements of modern steamers, stating that in most cases they should be independent of the main engines, which is to some extent contrary to existing practice in this country, although in America and Germany the later war vessels were fitted with independent auxiliary machinery. In the merchant service the *St. Paul* and *St. Louis*, as well as the new German liners, have their pumping arrangements quite independent of the main engines. One very good reason for independent condenser and circulating pumps is that in stormy weather, when the engines "race" owing to the pitching of the vessel, the only things which do become troublesome are the pumps. By making them independent of the main engines, as advocated by Mr. Thom, this trouble was got over. Mr. Thom, by means of several wall diagrams, described these independent pumps and the various arrangements of the valves. An interesting and lively discussion followed, in which the advocates of pumps attached to the main engines and pumps independent of them, gave expression to their opinions.

Hitherto the "Institution of Engineers and Shipbuilders in Scotland" has not evinced any very migratory disposition, and unlike most other institutions of a similar character in this country, has not held summer or autumn meetings in different centres. On only one occasion has it held a meeting outside of Glasgow, viz., in July, 1872, when the members went to Newcastle-on-Tyne and held a joint meeting with the North of England Institute of Mining and Mechanical Engineers, at which the "Nicholas Wood Memorial Hall" was formally opened and a statue of Nicholas Wood unveiled. The Scottish Institution now has a membership of 1,050, large additions having been made during the past two years; and recognising more than ever that summer meetings in different localities will tend to increase the interest in the society's proceedings, and provide excellent opportunities to the members of becoming better acquainted with each other, and of seeing the progress made outside their own particular sphere, the council has decided to hold a meeting this summer, and probably to continue doing so in future. The centre selected for visitation on this occasion is Sheffield, than which, probably, no more interesting and attractive destination could have been hit upon. The date of the meeting has not yet been definitely fixed, but in all likelihood it will occur about the "Fair Holiday" period in July, when most of the engineering shops and shipyards on the Clyde are inoperative. Several of the largest firms in Sheffield have signified their pleasure at the projected visit of the Scottish Institution, and a cordial reception is assured.

The members of the Glasgow University Engineering Society are organising a spring excursion to the banks of the Mersey, which promises to equal in interest the one which they had to Newcastle and Tyneside last year. They will visit Liverpool and Birkenhead, including Messrs. Laird's shipyard and engine-works, the works of the Sunlight Soap Co., the electric railway, and that portion of the dock-works where they can see the grain lifted out of the holds of the great Atlantic steamers and run into the mills or stores near by. The members may also have a run through one of the great Atlantic liners, either of the Cunard or White Star Companies.

THE TYNE.

(*From our own Correspondent.*)

Shipbuilding.—Four of the leading shipbuilding firms on the Tyne, namely, Messrs. Armstrong, Whitworth & Co., Messrs. Hawthorn, Leslie & Co., Messrs. C. S. Swan & Hunter, and the Palmer Shipbuilding Co., have been invited to tender for the new cruisers about to be ordered by the Admiralty, and a strong expectation exists that a portion at least of the latest shipbuildingp rogramme will be executed on the Tyne. Not that there is not already an abundance of work in the local yards, but the denizens of the populous area skirting the Tyne on both sides, between Newcastle and Shields, have some thought for the *prestige* of their district, and would think it strange indeed if rival centres were to monopolise all the good things to be given out. Of the four firms that have tendered, all have had Government orders previously, excepting Messrs. Swan & Hunter, and should this firm now succeed in securing a contract, there is no reason to doubt that they will abundantly justify their selection.

Though enquiries for new merchant ships are still sufficiently numerous, only a limited business has been done in the placing of orders lately, the main reason for this being that delivery cannot be guaranteed in less than eighteen months. This means, of course, that all the builders have as much work as they can very well manage to get through in the time indicated, and the outlook for those sections of the working community connected with shipbuilding and its contributory industries is consequently cheerful in the extreme. It is to be hoped they will not spoil their good fortune by ill-advised attempts to force up wages beyond the point which contract conditions will permit of, and in this connection they must not lose sight of the fact that the United Kingdom, though the most prolific and the most capable, is no longer the *only* ship-producing country in the world.

The activity at the Elswick yard of Messrs. Armstrong, Whitworth & Co., has in no way diminished, but rather increased, during the past month, and two or three of the warships on the stocks have been well advanced towards completion. The fitting out of vessels in the water is also being very rapidly proceeded with, and extra time is being worked.

At the company's Low Walker yard, where, among other special contracts, a powerful ice-breaker for Russia is in progress, exceptional briskness also continues to be maintained. Messrs. Dobson & Co. have launched a twin-screw steamer, intended for trading on the Caspian,and the vacated berth is being prepared for the reception of another keel.

Messrs. Wigham Richardson & Co. are busy with some high-class steamers for foreign account; and at Messrs. Stephenson's yard the shipment, in sections, of a large pontoon dock, ordered for the Spanish Government, is being proceeded with.

There is reason to believe that Messrs. Hawthorn, Leslie & Co. have been commissioned to build two of the big boats intended for the Canadian mail and passenger service, in respect of which it is understood that a contract has been entered into between Messrs. Petersen & Tate, of Newcastle, and the Canadian Government. Three boats are to be put on the station, and it is believed that Messrs. C. S. Swan & Hunter will be commissioned to build the third. All three will be of the "turret" type, modified, however, in such a way as will greatly extend the areas of the main and promenade decks. The vessels will be built to meet all the requirements of the modern trans-Atlantic passenger service, and will have twin engines designed for the attainment of a high rate of speed. The engines for the two vessels, to be built by Messrs. Hawthorn, Leslie & Co., will be supplied by the builders from their St. Peter's works, while the machinery for the third vessel will be constructed by the Wallsend Slipway & Engineering Co., Limited. Provisional contracts for shafting and other accessories have already been given out by the first-named firm, and probably by the last-named also, and two well-known gentlemen connected with Tyne yards are now in Canada arranging—it is supposed—the final questions of detail in regard to the carrying out of this important enterprise.

The Palmer Shipbuilding & Iron Co., have, in addition to other contracts, a large vessel well advanced, for the Wilson's-Furness-Leyland Line of steamers, and are said to have booked another order lately for a vessel of between 10,000 and 11,000 tons capacity. The fitting out of cruisers and torpedo destroyers, in the river, is being proceeded with as rapidly as possible, and it is expected that practically all of these that are yet in hand will be ready for delivery long before the end of the year. There is a probability that the firm will find it necessary to re-open their Howdon establishment—where there is room for the building of six good-sized vessels—and this will certainly be done should they succeed in obtaining a share of the new work to be given out by the Government.

The Tyne Iron Shipbuilding Co. have their berths fully occupied, and it is understood that there are other vessels to be put down as soon as berths become vacant. The appearance of Messrs. Readhead's yard has varied little for years past, the normal condition being: berths filled with vessels of large size in various stages of progress from keel-laying to launching; with new vessels under the shearlegs getting their machinery; and old ones moored at another point for the purpose of having carried out repairs and alterations to the decks or the interior fittings. This appearance is maintained in all its features at the present moment, and there are besides, one or two important contracts in course of execution in the graving-dock department. The small yards at North and South Shields are well supplied with orders for fishing vessels and other small craft, and at all the repairing establishments business is tolerably good.

The arrangements for commencing work in the new yard at Wallsend, belonging to the Parson's Steam Turbine Co. are being energetically pushed forward, and it is probable that productive work will be commenced by midsummer.

In the building of ships' boats, which was once a flourishing industry on Tyneside, there is now but little doing, the recently introduced steel boats having—presumably—the preference of many owners. This is not very easy to account for, seeing that in first cost the latter exceeds the former, and also that the latter, when damaged, are more difficult to repair. The subject of ships' boats is one that is worthy of more attention than it receives, and we are of opinion that an enquiry into the relative merits of wood and steel as constructive materials for ships' boats would establish the fact that the older material, when properly seasoned before using, is in many ways preferable to the new. It is, at all events, more buoyant, and is on that account better suited to the purpose of life-saving at sea than the material which has partially displaced it.

Engineering.—The sudden death of Colonel Dyer, president of the Engineering Employers' Federation, has, at the time of writing, cast a gloom over this district, with which he was for many years directly connected. The deceased gentleman was, during the continuance of the late strike in the engineering trade, subjected to much unmerited abuse—which he bore like the stout-hearted soldier that he was, never descending to recrimination; but, at the same time, never allowing himself to be diverted from the purpose he had in view. It is to be hoped that his traducers will now be thoroughly ashamed of themselves; for they can hardly get away from the thought that they may have, in some sense, been contributory to this sudden closing of a fine career. It is practically certain that the strain and worry of the strike had the effect of aggravating the complaint from which he suffered, and it is not going too far to say that the effect was not rendered the less harmful by the stream of abuse and misrepresentation that was poured upon him every day. Other employers came in for their share of vilification, but it was at Colonel Dyer that all the more envenomed arrows were directed. These magnanimous foes never had the grace to apologise during the Colonel's life-time, though the whole of their statements affecting him had been proved baseless. Now that he is dead, it remains to be seen whether they are possessed of sufficient manly feeling to express regret for the evil they have done. Attempts have been made to induce the general body of engineers to loathe the name of the gentleman whose death is here recorded. The success of these attempts has, we think, been very limited, and we are convinced that the more thoughtful men now recognise that Colonel Dyer was a truer friend to them than any of the windy orators, whose practice it was to revile him behind his back, can ever be.

The utmost pressure of activity continues to exist at all the marine engine works in the district, and all the available skilled labour is now fully absorbed. We have heard reports as to a difficulty in getting hands for certain departments; but we think the rumours are exaggerated, and that there is not, as yet, much to complain of, on this score.

Messrs. Noble & Lund, of the Northern Machine Tool Works, Felling, are now extremely busy, and the whole of the machinery is kept going night and day. In the department devoted to the manufacture of Mudd's patent piston rings, orders are plentiful, several exceptionally important ones having been booked during the last couple of months. The firm have also a number of their special type of band-saws in hand, most of these being intended to supersede slotting machines in engineering works. The firm has lately received an order from the Clyde for a band-saw of exceptional dimensions, being the largest yet manufactured by them. Of this machine—which will be unique in its way—we hope to be able to give particulars later on.

The equipment of the new foundry recently added to the firm's premises is now being proceeded with, and it is hoped that, by the end of May, productive work in this, as well as in the other departments, will be in full swing. It is, we believe, the present intention of the firm only to manufacture castings for their own requirements, which, it is expected, will fully absorb the foundry output. By this arrangement the firm will be able to get castings when they want them, instead of having to wait for them indefinitely, as hitherto. What is of still greater consequence, however, they will be able to ensure a degree of excellence in the quality of the castings, which was previously unattainable. To make good machine tools, sound castings are essential, and these, Messrs. Noble & Lund now intend securing for their own use.

The briskness in shipbuilding has caused a greatly stimulated demand for ventilators and other steamship accessories, and manufacturers in these lines are just now quite busy. Messrs. Proctor & Son, of the Side, Newcastle, are especially so, and are finding the accommodation afforded by their new works at Gateshead most useful under present circumstances. These works were acquired and, after the carrying out of necessary alterations, elaborately fitted up by the firm some eighteen months' ago, in anticipation of a busy time in the near future, and results have amply verified the firm's foresight. There are orders enough now in hand to keep the place briskly going during the whole of this year, and keeping in view the probability of further work being secured, there appears to be no reason to apprehend the advent of slackness here for a very long time to come.

At Messrs. Carrick & Wardale's Works, Redheugh Bridge, business is brisk, more especially in the department devoted to the manufacture of ships' pumps. The Dunston Engine Works are also kept steadily going, steamship repairs entering largely into the business of the establishment. Steel and iron works are keeping busy, and prices are maintained at the rates recently prevalent. In the forges work is brisk, and at many foundries signs of increasing business are not wanting. Brass foundries and coppersmithing works are fairly well employed, and the only chain and anchor making factory now on the Tyne is showing a fair degree of briskness.

Electrical Engineering.—The works of Messrs. J. H. Holmes & Co. are very busy, though that is nothing new to say, as they have scarcely been otherwise at any period since their first opening. Since then they have been twice extended, and are now very much more than double the size of the original works; yet the demand for electrical service has so increased that this firm, with its more than doubled resources, finds it about as much as it can do to meet the wants of customers, and will, doubtless, have to make a further extension, if such is practicable.

Messrs. Clark, Chapman & Co. are also well supplied with orders for their electrical department, and a good many ship-lighting contracts have been secured by them.

Messrs. Parsons are also busy, and Messrs. Ernest Scott & Mountain, Limited, have as much work in hand as—with their very large resources—they can deal with. We understand that the new departure in electrical engineering which was made by Messrs. Thomas Richardson & Sons, of Hartlepool, last year, has turned but a great success, and that an abundance of work has been secured.

THE WEAR.

(*From our own Correspondent.*)

Shipbuilding.—Sir James Laing & Sons are now preparing to launch two vessels of different types, but both of great importance. The first to be put off the stocks is the *Tuscarora*, a vessel of 11,500 tons capacity, which has been built to the order of the Anglo-American Oil Co., and is intended for the carriage of oil in bulk. The vessel is very strongly and elaborately fitted inside, an immense lot of material having been absorbed in the making of transverse and longitudinal bulkheads, tanks, and barriers. The other vessel is a Japanese twin-screw mail boat of large size and superior equipment. The engines for the oil-ship will be supplied by Messrs. John Dickinson & Sons, and those for the mail boat, by Messrs. George Clark, Limited.

Messrs. Doxford are said to have received from the owners of the Clan line of steamers (Messrs. Cayser, Irvine & Co.) an order for two "turret" steamers, to be 4,500 ft. long, and of proportionate depth and width. The firm are busily refitting a small craft of torpedo-boat design, which they built, apparently for experimental purposes, some years ago; and it is thought that negotiations for her sale are in progress.

Messrs. Short Bros. have still a lot of repair work, as well as new work in hand, and the frame furnaces are kept going night and day.

At Messrs. Priestman's, Messrs. Pickersgill's, and Messrs. Robert Thompson's, no change is to be noted, each of those establishments continuing to be fully supplied with work.

The Sunderland Shipbuilding Co. have sold to Messrs. Elder, Dempster & Co., Liverpool, a large steamer, only recently completed, and which is now being got ready for delivery. The company are building a still larger vessel for Mr. William Lund, of London, to whom they have in years past supplied several vessels of a superior class. They have also in hand some smaller vessels, two of which are now being prepared for launching.

At Messrs. Bartram & Sons the activity previously noted is still maintained.

Among the orders in hand at the yard of Messrs. Blumer is a vessel of good size, for Whitby owners, which is to be engined by the North-Eastern Marine Engineering Co., Sunderland. It may here be mentioned that the two large vessels at the Sunderland Shipbuilding Co.'s yard are to be engined at the Wallsend branch of the N.E. Co.'s works. The state of business at the

North Sands yard (Messrs. J. L. Thompson & Sons) is still very active.

Engineering.—The engines for the large oil boat about to be launched at Laings' yard are well advanced towards completion, and are probably among the very largest that have yet been constructed at the Palmer's Hill Works. At this establishment there are several other important contracts in hand, and business is exceedingly brisk. The Southwick Engine Works are also continuing very busy, and the same may be said respecting Messrs. Doxford's Works, Pallion. At Messrs. MacColl & Pollock's there are nine sets of engines to be manufactured and delivered by the end of the year, and that the firm have confidence in being able to fulfil their engagements is shown by the fact that they have just booked a set of engines for a 3,000 ton boat. The engines turned out by this young but enterprising firm have up to the present been most successful, satisfactory results as regards speed and fuel consumption having in every instance been attained. The firm are now engining a twin-screw boat, built on the Tyne to the order of Russian owners, and to which Cedervall's patent "box" for the protection of propeller shafts, is being fitted.

The works of Messrs. John Lynn & Co. continue to be very busy, orders for steering gears, steam winches, and other deck accessories being plentiful. The Bloomfield Engine Works (A. A. Rickaby) are also very briskly employed, the piston rings and other steamship specialities manufactured by the firm being just now in good demand.

A new enterprise has been started by Messrs. J. G. Moore & Co., in premises which they have named the "Vulcan Works," and which have been altered and adapted to the requirements of the firm in the manufacture of marine engines, ash-hoists, ships' models, &c. The firm have orders in hand for launch and paddle engines, and also for compound surface condensing engines, besides ash hoists, models, &c., and appearances indicate the probability of a prosperous future being assured.

The Hartlepools.—At this centre the shipbuilding outlook is excellent, and in the engineering establishments business is as active as could be desired. The steel works are also busy, orders being plentiful, and most of the other local industries are showing improvement.

Stockton.—Messrs. Ropner and Messrs. Craig, Taylor & Co. are reported to have booked orders lately, and at all the yards work continues active. Engineering works, steel works, &c., are, without exception, well employed.

Middlesbro'.—The shipyards here, as elsewhere, are busy, and engine works are showing a proportionate state of activity. At the works of Messrs. Furness, Westgarth & English an exceptionally large set of marine engines is in progress. Steel works are kept actively going, but at the docks business is dull.

Consett.—The Consett Co.'s works are as busy as possible, and the weekly output from all departments is above the average of recent years.

THE MERSEY.

(From our own Correspondent.)

ALL branches of the engineering trade may now be regarded as having got into full swing again after the protracted dispute, and what with the pressure to complete orders only partially executed during the long stoppage, and the large weight of new work—a good deal of which was held in abeyance during the lock-out and strike, but which has now come forward, all sections of the engineering trade are in a position of altogether exceptional activity. This is especially noticeable amongst machine-tool makers, stationary engine and locomotive builders, and boiler-makers. Very few leading machine-tool makers are, in fact, in a position to undertake new work for guaranteed delivery this year, and not a few firms have been compelled to allow considerable orders to pass by owing to their inability to comply with requirements for specified completion. The great activity in the shipbuilding industry is, of course, having its effect upon machine-tool makers in this district, as it is bringing forward enquiries for various descriptions of heavy tools and plant required for marine engineering and shipbuilding work. There is also a great demand for all descriptions of railway rolling stock, and in every direction the prospect is one of exceeding briskness throughout the engineering industries, not only all through the present year, but well into next year. Generally, the workmen have settled down with very slight trouble under the new conditions, but here and there slight friction has arisen on small matters, and in some quarters there are complaints with regard to the action of federated employers in not taking on all the hands that were engaged with them prior to the lock-out and strike, insinuations, of course, being made that not a few of these men are not being re-engaged on account of their prominent connection with the trade unions. Of course, there are new conditions at the works which are probably irksome to many of the operatives, but under present circumstances they deem it more prudent to submit than to attempt any reprisals upon the employers. Nevertheless, there is a good deal of discontent amongst many of the trade-union workmen, and it only needs the opportunity for some of them to show their strong resentment of the terms on which the work is now being carried on in most of the engineering shops.

Messrs. Laird Bros. report nothing of special moment in connection with the shipbuilding trade. The *Presidente Sarmiento*, which they have built for the Argentine Navy, has been taken out for her preliminary trial trip, and although no speed trial was attempted, the vessel proved very handy, and gave promise of a first-rate performance. With regard to the torpedo destroyers built by the firm for H.M.'s Navy, the *Wolf* has now completed her official full-power speed trials on the Clyde in the presence of the Admiralty representatives. Six runs were made on the measured mile, and the mean speed realised was 31·2 knots. After completing the six miles the vessel was taken outside the Cumbrae to complete the three hours' steaming at her contract speed of 30 knots, and the result at the finish showed a speed of considerably over a quarter of a knot in excess of the contract. After this trial the usual steering tests at full speed ahead and astern were carried out, and the stopping, starting, and reversing of the engines demonstrated the efficiency of the vessel. It may be added that the *Wolf* is the tenth 30-knot destroyer that the firm have now completed for the British Admiralty.

Some time back reference was made in these Notes to a special multiple punching machine, supplied by Messrs. De Bergue & Co., Manchester, to Messrs. Swan & Hunter, for punching the pontoon plates in connection with the large floating dock recently completed by the last-named firm. We are informed that Messrs. G. Stephenson & Co., of Hebburn, Newcastle-on-Tyne, seeing the rapid way in which the above machine did its work, ordered a similar one from Messrs. De Bergue for a pontoon for which they had a contract, and that this also has proved very successful in operation. Orders for two of these machines have also been received from firms in Holland, and it is worthy of note that foreign firms are, as a rule, far more ready to adopt labour-saving appliances of this description than are English establishments.

Messrs. G. Birch & Co., Salford, Manchester, have designed a new circular saw for cold iron and steel. This machine has a frame of box form, which contains recesses for the saw and gearing. These recesses also form receptacles for the lubricant, by which the saw and gearing are always self-lubricating. The work table is attached to the frame by a jibbed V slide, having ample bearing surfaces, and plain tee slots, which provide for clamping the work to the table. The saw is driven by a solid steel worm, working in a hard gun-metal worm wheel, the worm and shafts being provided with large thumb collars of special make. The work is fed by worm and friction gearing, having a clutch starting and stopping motion. An adjustable stop motion is provided, so that the attendant is not required to stay by the machine after starting it, and there is no danger of over-running. The saw is driven by fast and loose pulleys, with special belt fork arrangement, which enables the strap to be run at any required angle. The machine is fitted with a clamp arrangement for holding bars when sawing, and will cut bars of any length up to 5½ inches in diameter. This tool will be found very useful in marine and general engineering shops, for operating upon bars, &c., that require sawing off.

Mr. John J. Royle, Dalham Works, Manchester, has brought out a new instantaneous water heater, which is specially suitable for heating lavatory and bath water on board ships, the heater being fixed immediately above the lavatory basin or bath, either salt or fresh water, or a mixture of both, being admitted through valves. If the water is required heated, the steam valve is opened and the result thus obtained. The firm have also an improved calorifier for use in public institutions, &c. This consists of a series of Row's patent tubes placed within a suitable casing either of iron, steel, or copper, and arranged so as to be readily accessible for cleaning, the steam supply being controlled by Royle's patent automatic attachment. Another useful apparatus is one for supplying hot water for works, &c., by means of steam. This gives a quantity of boiling water in a very few minutes by simply turning on steam, and it can be so arranged with an automatic control-valve, that when the water attains boiling point it will not boil violently, but simply be maintained at a gentle boil, ready for immediate use.

A new pattern gas engine, specially suitable for light work, has been put upon the market by Messrs. Crossley Bros., Limited. This is an exceptionally small horizontal engine, and they have styled it their 8-man power engine, although it will work up to 2 H.P. if required. It is very economical in operation, and supplied at a reasonable figure. The firm are completing works extensions which will greatly increase their productive capacity, and they are now in a position to turn out 70 engines a week, exclusive of pump work, millwrighting and jobbing. These extensions include a new shop set apart exclusively for the manufacture of oil egnines, whilst another new department is one for all descriptions of brass work.

Messrs. Fletcher, Russell & Co., Limited, of Warrington, Manchester, and London, are making an improved rivet-heating furnace, using ordinary petroleum oil, and which will be found a very serviceable addition to the ordinary plant in shipbuilding yards, bridge builders' works, &c. The furnace is portable, and automatic in action, and will heat from three to four hundred rivets per hour. The firm also make a couple of specialities in bar-heating furnaces, in which the length of bar to be heated can be regulated to any desired extent. For one of these they expect a large trade in the mining districts of South Africa, where it has been protected.

The Unbreakable Pulley Co., Limited, of Manchester, have introduced a new friction clutch, containing several special features. The patented novelty of this invention consists in the method of applying to the extremities of the screw-levers the power from the usual sliding sleeve upon the shaft. The connecting links are pinned to a gimbal or ring, pivoted on the sleeve. instead of being carried in rigid centres as is usually the case. By this arrangement any pressure put upon the sleeve is transmitted with equality to the two friction blocks, as either one of these gives the reaction for the other, and uneven wear on the blocks or undue strain upon one part of the mechanism is avoided.

In the iron trade business during the month has been only very moderate, although prices have maintained a steady tone. Large users are mostly well covered for present requirements, and, so far as the engineering industries are concerned, although there is a large amount of new work to come forward in the shops, it is exceptional where any heavy weight of this has so far been put in hand, so that the resumption of operations has not yet made itself appreciably felt upon the demand for raw material. The business coming forward, however, is sufficient to take away any iron that makers have at present to offer, deliveries on account of contracts keeping them fully going. There is still low selling, here and there in the open market, but makers generally hold to late rates. For local and district brands quotations remain at 45s. 6d. for forge to 48s. 6d. for foundry, Lancashire, less 2½; 43s. for forge to 45s. 6d. for foundry, Lincolnshire; and 48s. 6d. for foundry, Derbyshire, net cash. delivered Manchester. Outside brands are rather stronger, good foundry Middlesbrough averaging 48s. 10d. to 49s. 7d., net delivered by rail, Manchester, with Eglinton 50s. to 50s. 3d. and Glengarnock 49s. 9d. nett prompt cash, with ordinary American foundry pig-iron offering at 45s. to 45s. 3d., delivered Manchester Docks. For American pig-iron there are fair enquiries at a trifle under the above figure, but sellers are not very ready to give away, some uncertainty being felt as to the probability of American pig-iron coming over here in such large quantities as was anticipated a short time back.

The finished iron trade has shown no material change. Bars are in good demand, but makers are unable to get any appreciably higher prices. Lancashire qualities still average £5 12s. 6d. to £5 15s., and North Staffordshire, £5 17s. 6d. to £6. Sheets are very quiet, and do not fetch more than £6 15s., and hoops meet with only a slow demand at the association list rates of £6 10s. for random to £6 15s. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

Activity is reported generally in the steel trade, and prices tend to harden. Some of the lower qualities of hematites are still obtainable at 57s. 6d. to 57s. 9d., but other brands are quoted 58s. 6d. to 59s. 6d. less 2½. Local made billets average £4 6s. 3d. net, and steel bars £6 to £6 5s. Plates have made a material advance, common qualities now fetching as much as £6 2s. 6d. to £6 5s., with boiler plates quoted £6 10s. delivered in this district.

The metal market is very brisk and works are busily engaged on orders in hand. The upward move in raw material has been followed by an advance in manufactured metal goods, brazed brass tubes, rolled brass, and copper and brass wire having been put up ¼d. per lb. Delivered in this district list rates are now as under:—Solid drawn brass boiler tubes, 7¼d.; brass surface condenser tubes, 8¾d.; copper tubes, 8¾d.; brazed brass tubes, 8d.; common rolled brass, 6d.; common brass wire, 6¼d.; copper wire, 7¼d. per lb.

In the timber trade business has been quiet, with no material change in values to record. Greenheart and teak continue in much the same position as last reported.

During the month there has been a fairly active demand upon the better qualities of round coal suitable for housefire purposes, and pits have been working full time, and readily disposing of their output, but business has shown rather a tapering off, and the demand is only moderate, whilst prices are not more than steady at list rates. Steam and forge coals are in tolerably good demand, but supplies are plentiful, and late prices are barely maintained. Engine fuel moves off fairly well, the restricted demand for housecoal keeping down the output of slack, and at many of the collieries supplies are short, but in the open market supplies offering are ample, and there is no alteration so far as selling prices are concerned. At the pit-mouth best Wigan Arley averages 10s. to 10s. 6d.; Pemberton four-foot and seconds Arley, 8s. 6d. to 9s., and common house-coal, 7s.; with steam and forge coal, 6s. to 6s. 6d., and engine fuel, 3s. to 3s. 6d. for common, 3s. 9d. to 4s. 3d. for medium, and 4s. 6d. to 4s. 9d. for best qualities.

The shipping trade is only moderate, and with common coa offering freely, orders can be placed at very low figures, common steam coal being readily obtainable at 7s. 6d. to 7s. 9d., with better qualities quoted 8s. to 8s. 3d. delivered Mersey ports.

BELFAST.

(*From our own Correspondent.*)

BOTH the shipbuilding and engineering industries in this city continue in a very prosperous state, and there seems to be exceptionally few men idle, indeed, here it is hard to realize that there has been such a prolonged struggle between capital and labour. Both Messrs. Workman, Clark & Co., Limited, and Messrs. Harland & Wolff, Limited, are extremely busy, the latter firm having had to put on night shifts in their boiler-shop and brass department, as well as in their engine-shop. This has necessitated their having to appoint a manager for their night shifts alone. and the many friends of Mr. Wm. Gouk, who has, for many years, been head foreman in the engine shop of this well-known firm, will be glad to learn that he has been promoted to this position.

Whilst writing about this firm (Messrs. Harland & Wolff, Limited) we may mention that their name has been brought more or less under public notice by the question having been raised in the House of Commons as to why they cannot be induced to tender for the building of ships for our Navy. So far as appliances and equipment of their works are concerned, we feel sure there is nothing to prevent them doing so, and are inclined to believe the only reason why they do not take such work in hand is because there is no graving dock here capable of accommodating a large battleship, and until the new Harbour Bill becomes law the Harbour Commissioners are unable to do anything to further this much desired object, which it is estimated would give employment to some thousands of men, and remove the only barrier which stands in the way of Belfast taking the position it should amongst the great shipbuilding centres in regard to Admiralty work.

The new twin-screw steamer *Brazilia*, as mentioned by us a month or two ago as having been launched from the yard of Messrs. Harland & Wolff, Limited, has now been completed, and left her moorings in Belfast Harbour on the 21st March, proceeding down the Lough on her trial trip. The steamer has been built under special survey for the highest class of Germanischer Lloyd's, has a very large cargo carrying capacity, and is also fitted up to carry a large number of emigrants. She is built of steel, is 10,961 tons gross, and of the following dimensions:—Length, 500 ft.; breadth, 62 ft.; depth, 37 ft The engines, also supplied by her builders, consist of a double set of quadruple-expansion surface condensing type. The saloon, which is situated on the bridge deck, is decorated in teak and oak, and the passengers' cabins are also done in solid Austrian oak. She is fitted with every mechanical facility for the rapid loading and discharge of cargo, as also with refrigerating machinery and a complete installation of electric light. After a very satisfactory trial, and adjustment of compasses, the *Brazilia* proceeded on her way to New York under command of Captain G. Reesing.

During the past month, the Hamburg-American Liner *Prussia*, which was built by Messrs. Harland & Wolff, Limited, about a year ago, arrived in Belfast and will shortly undergo an extensive overhaul, which, needless to say, will be carried out by the builders.

With regard to Messrs. Workman, Clark & Co., Limited, this firm have at the present time five steamers launched ready for boilers and engines, the last being a large steel screw steamer called the *Indore*. This vessel has been built to the order of Messrs. Edward Bates & Co., of Liverpool, and her dimensions are as follows:—Length, 480 ft.; breadth, 25 ft.; depth, moulded, 38 ft.; with a gross tonnage of about 7,300, and capable of carrying a deadweight cargo of 8,800 tons. She has been built in excess of Lloyd's spar deck class and with Board of Trade passenger certificate, and has three complete laid decks, as well as poop, bridge, and forecastle decks, of chequered iron, the upper also being chequered. On the upper and bridge decks upwards of 800 head of cattle are arranged for, and completely covered in by the shelter decks, on which several thousand sheep can be carried. The machinery will also be supplied by the builders, the engines to be triple-expansion, inverted direct acting, with cylinders 29½ in., 50 in., 82 in., and a stroke of 60 in. Four large steel boilers supply steam at a working pressure of 200 lbs., and are fitted with patent flues. A complete installation of electric light will also be fitted.

In addition to these steamers on hand, Messrs. Workman, Clark & Co. have booked several important orders for local firms, one being for the "Head" Line of steamers, and another for the well-known "Lord" Line. These, in addition to the order for the popular "Star" Line, as mentioned by us last month as being booked by this firm, will certainly keep them busy for some time to come. They have also some extensive repairs on hand, the most recent of these being the *Amethyst*, which came into collision with the cross-Channel steamer to Fleetwood during the past week, and it is reported that the damage done is considerable.

Trade with the other engineering and machine shops in this town seems to be in the same flourishing condition, so that the present outlook for Belfast is a bright one.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow-in-Furness.—Since the settlement of the engineers' dispute there has been a gradual and very marked growth in the activity of shipbuilders and marine engineers in this district, and there are indications that the present briskness will only be the forerunner of a still more active state of things in the future. During March, some very large orders were booked by Mesers. Vickers, Sons & Maxim. In the first place the British and African Co. placed an order for two passenger and cargo steamers 345 ft. long, 42 ft. broad, and 25 ft. 8 in. deep. These vessels will be propelled by engines of 2,000 I.H.P., and are intended to carry a large number of passengers, mails, &c. Several steamers for the same owners have already been built at the Barrow yard. Another order was secured during the month from the Pacific Steam Navigation Co. for a large passenger and mail steamer. She will be 500 ft. long, 55 ft. broad and 37 ft. deep, with accommodation or 154 first-class, 159 second-class, and 300 third-class passengers. The engines will develop 8,000 I.H.P. Following this order came one from the Admiralty for an armoured cruiser of the *Cressy* type, one of four placed out with private builders. March has thus been a record month for orders. Messrs. Vickers, Sons & Maxim have now about 82,000 tons of shipping in various stages of construction, and the orders they hold represent an aggregate value exceeding two millions of money. The character of the work in hand is such that every department of the works will be kept very busy for a considerable time; indeed, it is evident from the alterations now being carried out, and others that have just been decided upon, that extensions and developments will be carried out in every department of the yard, with a view to increase the capacity of production. The building yard is one of the best in the world, giving accommodation for the erection of fifteen to twenty big ships at one time, but the machinery and the workshops would at present be scarcely equal to an output of prepared material such as so large a trade would demand. It is in this direction that extensions are being made. With new orders just booked and those already on hand of ships not yet launched, there will be 10 ships on the the stocks, representing nearly 70,000 tons. There is a good demand for new shipping, and although builders are now very busy it is reasonable to expect that further orders will soon be received. Preparations are in progress for the launching of the new Fleetwood and Belfast boat in April and soon afterwards H.M.S. *Amphitrite* will be launched. She is well forward. Her sister ship, the *Niobe*, is ready for her dock trials, and may be expected to leave Barrow next month for Devonport, where her trials have been fixed to take place. Work has commenced in the building of the two Clan Line turret ships, and the Telegraph Cable laying steamer is well in frame and the platers are beginning their work. There is full activity in the shipbuilding department, and two shifts of men are employed night and day in the engineering shops. Work which was much behind in this department is gradually being caught up to and in the course of another three months the upset of the balance of things caused by the strike will have been rectified. There is one great satisfaction in all the present briskness of trade, the relations between masters and men are of the most amicable character, so the work is proceeding smartly and satisfactorily, and everything tends to show that this is likely to be a record year as regards tonnage of output and I.H.P. built, as well as the beginning of what promises to be a long period of general shipbuilding and engineering activity. In addition to the new work in progress there are three tripling jobs in hand for the Clan Line, and repairs to a Great Western Railway Co.'s paddle steamer.

Shipbuilding Material.—Business with steelmakers shows a distinct improvement. The demand for shipbuilding material in the shape of plates, sections, &c., has gone up by leaps and bounds, and is now of so pressing a character that prices must naturally advance. Orders from all sources are very large, and builders are beginning to clamour for deliveries. There is a good demand for heavy steel castings, and business generally in the steel trade is brisk and healthy.

West Cumberland.—Shipbuilding at Maryport is not so brisk as it has been, and the Messrs. Ritson do not seem to be booking new tonnage as fast as of late, although there is a big demand for the small craft usually built here. At Messrs. Williamson's yard at Workington there is a fair amount of activity, and this is likely to be maintained.

The Hematite Trade.—A brisk demand is maintained for hematite pig-iron and the market is improving week by week. Makers are very fully sold forward, and are quoting 50s. a ton, nominally, for mixed Bessemer Nos. net f.o.b., while warrant iron is selling at 49s. 1d. net cash, buyers offering 49s. ½d. Stocks have been depleted during the month about 5,000 tons and now stand at 179,000 tons in warrants.

Shipping.—The shipping trade is actively employed as regards metal exports. The total shipments this year up to date total up to 109,712 tons of pig-iron, and 123,779 tons of steel, as compared with 85,006 tons of pig-iron, and 98,122 tons of steel in the corresponding period of last year, showing an increase of 24,706 tons of pig-iron, and 25,657 tons of steel.

Messrs. Lockwood & Carlisle, Eagle Foundry, Sheffield, have, for family reasons, registered themselves as a Limited Company, under the Companies Acts 1862-93, by the title of Lockwood & Carlisle, Limited. The capital of the Company will be all subscribed by the partners, and no shares will be offered to the public.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Annie.—On February 7th there was launched at North Shields a steel steam ketch of about 142 tons gross, named the *Annie*, for the Hartlepool Steam Fishing Co., Limited, Grimsby.

Nile.—On February 7th a steel steam ketch of about 144 tons gross, was launched at North Shields, for the Britannia Steam Fishing Co., Limited, Grimsby. She was named the *Nile*.

Butterfly.—On February 10th there was launched at Hull an iron steam ketch of about 180 tons gross for the British Steam Trading Co., Hull. She was named the *Butterfly*.

H.M.S. Dove.—On February 21st H.M.S. *Dove*, the second of the 30-knot torpedo-boat destroyers now building by Earle's Shipbuilding and Engineering Co., was launched from their yard at Hull. The customary ceremony was performed by Mrs. Pellow, the wife of Staff-Engineer Pellow, R.N., who is the overseer for the Hull district.

Sanna.—On February 22nd Messrs. William Gray & Co., Limited, launched a large steel screw steamer, which has been built to the order of Messrs. J. Christensen, of Bergen, Norway, and Hans B. Olsen, of West Hartlepool. She is the second ship built for these gentlemen, and the fifth for Mr. Christensen by Messrs. William Gray & Co., Limited. She will take the highest class in Lloyd's, and is of the following dimensions, viz.: Length over all, 341 ft.; breadth, 47 ft.; depth, 27 ft. 4 in.; with long poop and topgallant forecastle. A handsome saloon, state rooms, captain's room, &c., will be fitted up in a large deck-house amidships. The officers' and engineers' accommodation will also be on the bridge deck, and the crew's berths in the forecastle. The hull is built with web frames, large hatchways are fitted with eight steam winches, steam steering gear amidships and screw gear aft, patent direct steam windlass, two donkey boilers, cellular double bottom for water ballast, shifting boards throughout, stockless anchors, telescopic masts with fore-and-aft rig, boats on beams overhead, and a complete outfit will be provided for a first-class cargo boat. Triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. William Gray & Co., Limited, having cylinders 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., and fine large steel boilers with a working pressure of 180 lbs. per square inch, fitted with Howden's forced draught The hull and machinery have been constructed under the superintendence of Mr. John Black, and the ceremony of naming the vessel *Sanna*, after Miss Olsen, was gracefully performed by Miss Ragnhild Olsen.

Haliotis.—On February 22nd Messrs. Sir W. G. Armstrong, Whitworth & Co., Limited, launched this vessel at their Walker yard, the ceremony being performed by Mrs. Samuel, the wife of Mr. Alderman Marcus Samuel, to the order of whose firm the ship and a sister vessel are being built. The dimensions are:—248 ft. 6 in. over all, 40 ft. moulded, and 17 ft. 3 in. depth moulded; and the vessel has been specially constructed for the carriage of petroleum in bulk, under the supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool. There are one or two unusual points about this vessel, she being intended to use liquid fuel on her service in the East, and her engines and boilers have been fitted out with this special view. She is constructed on the trunk-turret system, which gives a larger carrying capacity in proportion to register tonnage than the ordinary form of construction. The engines for special reasons are of the compound surface-condensing type, taking steam from two boilers at 100 lbs. working pressure, and are 30 in. and 63 in. diameter by 39 in. stroke. Electric light is fitted throughout the vessel, and there is a complete installation of duplex pumps, for prompt dealing with oil cargo. The bunkers of this vessel are stayed, rivetted and caulked, so as to contain oil fuel, and they are also so arranged as to be available for coal in case of emergency.

H.M.S. Mermaid.—On February 22nd Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched from their Hebburn shipbuilding yard H.M.S. *Mermaid*. This vessel is the second of two being at present constructed by this firm, and is of the latest type of torpedo boat destroyers. Her length is 210 ft., breadth, 21 ft., and depth, 12 ft. 6 in., displacement, 308 tons. The main propelling machinery consists of two sets of vertical triple-expansion engines of specially light design, in the construction of which steel and the strongest bronzes have been used with a view of combining lightness with strength. The engines at full power will develop 6,000 I.H.P., when running at about 380 revolutions per minute. Steam will be supplied by four Thornycroft water-tube boilers, working at 250 lbs. per square inch, and arranged in two separate compartments.

Kelvin.—On February 22nd the steam trawler *Kelvin* was launched from Messrs. Cochrane & Cooper's yard at Beverley. She is to the order of F. & T. Ross, Limited, Hull, and is 112 ft. between perpendiculars, 21 ft. beam, and 14 ft. 6 in. in depth. The launching ceremony was performed by Mrs. J. F. Ross, in the presence of a good company.

Skipjack.—On February 22nd there was launched by Messrs. W. H. Potter & Co., at Liverpool, to the order of Sir Richard Williams-Bulkeley, Bart., of Baron Hill, Beaumaris, the steel steam yacht *Skipjack*. Her dimensions are:—Length, between perpendiculars, 84 ft.; beam, 16 ft. 6 in.; depth, 9 ft. 6 in.; her tonnage (yacht measurement) being 90 tons. She is fitted with triple-expansion engines by Messrs. Thomas Downie & Co., of Liverpool.

Golland.—On February 23rd there was launched at South Shields a steel steamer of about 180 tons gross, named the *Golland*. She is owned by Heron Carlberg, Dunkirk.

St. Vincent.—On February 23rd there was launched at North Shields a steel steam ketch of about 150 tons gross, named the *St. Vincent*. She is owned by the Britannia Steam Fishing Co., Limited, Grimsby.

Atlantic.—On February 24th there was launched at Beverley, to the order of W. C. Edwards & Co, Limited, of Hull, an iron steam ketch of about 170 tons, named the *Atlantic*.

Sihon.—On February 24th there was launched at Hull, to the order of the Standard Steam Fishing Co., Limited, of Grimsby, an iron steam ketch of about 160 tons, named the *Sihon*.

Hilda.—On February 24th there was launched from the shipbuilding yard of Mr. H. Scarr, at Hessle, a lighter of the following dimensions viz.:—Length, 62 ft.; beam, 16 ft.; depth, 8 ft. The vessel has been built to the order of Messrs. R. Grainger & Co., of Hull, and was named the *Hilda*.

Palestrina.—On February 25th Messrs. Bartram & Sons launched at Sunderland a large steel-screw steamer of the following dimensions:—Length, 350 ft.; breadth, 46 ft. 6 in.; depth, 26 ft. 9 in. The vessel is of the spar-deck type, with poop, long bridge, and topgallant forecastle, and has been built to take the highest class in Lloyd's registry. The engines will be supplied by Messrs. John Dickinson & Sons, Limited, and the cylinders are 24 in., 39½ in., and 65 in., and the stroke 42 in. During construction the hull and the machinery have been surveyed by Mr. Charles Metcalfe on behalf of the owners, Messrs. Jenneson, Taylor & Co., The vessel was named the *Palestrina*.

City of Hull.—On February 26th there was launched at Hull, for the City Steam Trawling Co., of Hull, an iron steam ketch of about 180 tons, named the *City of Hull*.

Pacific.—On March 7th there was launched at Hull a steel steam ketch of about 186 tons gross, named the *Pacific*. She is owned by the Grimsby Steam Fishing Co., Limited, Grimsby.

Oceanic.—On March 7th there was launched at Hull a steel steam ketch of about 186 tons gross, named the *Oceanic*. She is owned by the Grimsby Steam Fishing Co., Limited, Grimsby.

Emma.—On March 8th there was launched by Messrs. T. Turnbull & Son, at Whitby, a steel screw steamer to the order of Messrs. Turnbull Bros., of Cardiff. The vessel was christened *Emma* by Miss Maud Weighill.

Steel Screw Steamer.—On March 8th there was launched by Messrs. W. Harkess & Son, at Middlesbrough, a steel screw steamer to the order of Messrs. Pile & Co., London, of the following dimensions:—168 ft. by 26 ft. by 13 ft. moulded; specially designed for the general trades, to carry about 650 tons on 12 ft. draught. She is built with a raised quarter-deck, bridge, and topgallant forecastle, and is fitted with triple-expansion engines and boilers, working at 180 lbs. pressure. She is under offer to the Russian Government for survey work in the White Sea. The vessel has been built under the superintendence of Mr. John Barkley, of West Hartlepool.

Paddington.—On March 9th Messrs. Ropner & Son, of Stockton-on-Tees, launched to the order of Messrs. Evan

Thomas Radcliffe & Co., Cardiff, a steel screw steamer of the following dimensions: — Length, between perpendiculars, 336 ft. 6 in.; breadth, extreme, 46 ft. 6 in.; depth, moulded, 27 ft. 3 in. The steamer is built off the three-deck rule, and fitted with the builders' patent trunk, full poop, bridge, and topgallant forecastle. She will be completed under the inspection of Captain Hesketh, the owners' marine superintendent, and will be fitted with triple-expansion engines by Messrs. Blair & Co., Limited. The vessel was named *Paddington* by Miss Ropner, of Preston Hall.

America Maru.—On Wednesday afternoon, March 9th, there was launched from the Shipbuilding Yard of C. S. Swan & Hunter, Limited, Wallsend-on-Tyne, a twin-screw passenger and mail steamer, which has been built to the order of the Toyo Kisen Kabushiki Kaisha of Tokio, Japan, better known in this country as the Oriental Steamship Co. of Tokio, for carrying passengers and mails between China, Japan, and San Francisco, thus making the connection with the Union Pacific and the Southern Pacific Railways. The steamer is 441 ft. in length by 51 ft. beam and 32 ft. 6 in. deep to the upper deck. She has a clipper cutwater with bowsprit, and has a topgallant forecastle, a long bridge house with promenade deck above it, and a long poop. She is fitted up in luxurious style for the accommodation of 89 first-class passengers at the fore end of the bridge and under the promenade deck; accommodation is also provided for 28 second-class passengers in the poop, and for 200 steerage passengers in the 'tween decks forward. Comfortable quarters are also provided for the crew aft on the main deck, whilst the officers, engineers, &c., are accommodated at the after end of the bridge. The steamer has been designed to carry a large measurement cargo on a deadweight capacity of about 5,000 tons, to cope with which cargo she is supplied with a large number of powerful winches and other discharging gear. Water ballast will be carried in the peak tanks and in the cellular double bottom. The machinery will be supplied by the Wallsend Slipway and Engineering Co., Limited, and consists of two sets of exceptionally powerful engines, each having cylinders 28¼ in. by 46 in. and 75 diam. by 48 in. stroke, supplied with steam by five boilers having a total heating surface of about 20,000 sq. ft., and capable of developing about 7,500 I.H.P. and of propelling the steamer at a speed of 16½ knots per hour. The propeller blades are of manganese bronze, and special attention has been paid in the engine-room, and in the outfit and general details of the steamer to successfully carry out the important work which she will undertake. The requirements of Lloyd's classification, the Board of Trade, and the Japanese Government have all been strictly adhered to, and special attention will be paid in fitting up the accommodation to the comfort of the passengers in hot climates. A complete installation of refrigerating machinery with cold storage rooms will be provided, and the steamer lighted throughout by electricity. The steamer was named the *America Maru* by Mrs. Samuel, wife of Alderman Samuel, of the firm of Messrs. M. Samuel & Co., London. During the construction of the steamer she has been superintended on the owners' behalf by Captain Tomioka, of Tokio, assisted by the eminent consulting engineers Messrs. Flannery, Baggallay & Johnson, of London.

Povena.—On Wednesday, March 9th, Messrs. Wm. Gray & Co., Limited, launched the fine steel screw steamer *Povena*. She is of the following dimensions, viz.:—Length over all, 285 ft.; breadth, 41 ft. 6 in.; depth, 20 ft. 2 in., and has been built to the order of Raman de la Sota of Bilboa. She will take Lloyd's highest class, and her deck erections consist of a poop, raised quarter-deck, bridge and topgallant forecastle. The saloon and accommodation for captain and officers will be fitted in the poop, the engineers' berths amidship, and the crew's quarters forward. The vessel is built on the web frame system with cellular double bottom for water ballast and after peak ballast tank, steam winches, donkey boiler, steam steering gear amidship, screw gear aft, steam windlass, schooner rig, with patent folding masts, boats on beams overhead, and generally equipped in a first-rate manner for a cargo steamer. The engines are of the triple-expansion type working on three cranks. They are supplied by the Central Marine Engineering Works of Messrs. Wm. Gray & Co., Limited. The cylinders are 21½ in., 34 in., and 57 in. diameter, and the piston stroke 39 in., and two steel boilers will give an ample supply of steam at a working pressure of 160 lbs. per square inch. The vessel has been built under the superintendence of Captain Ricarda de Goiocsechea on behalf of the owners, and the ceremony of naming her *Povena* was gracefully performed by Mrs. Ballan, wife of the superintendent of the North Eastern Railway Co., West Hartlepool.

Iron Lighter.—On March 9th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, an iron lighter of the following dimensions, viz.:—Length over all, 70 ft. between perpendiculars, by 18 ft. 6 in. moulded beam, and 9 ft. moulded depth, with a carrying capacity of 200 tons. This vessel is the fifteenth built to the order of Messrs. Thos. Wilson, Sons & Co., Limited, Hull.

Dragoman.—On March 10th there was successfully launched from the Jarrow Yard of Messrs. Palmer's Shipbuilding and Iron Co., Limited, a finely modelled steel screw steamer of the following dimensions:—Length, between perpendiculars, 350 ft.; beam, moulded, 45 ft.; depth, moulded, 28 ft. 6 in. The vessel has been built under special survey to class 100 A1 in Lloyd's Register and is of the three-deck type, having a poop, bridge, and forecastle. Two complete steel decks are laid extending all fore and aft. The poop is fitted for cargo, and the officers' and engineers' are berthed on the bridge in large steel deck-houses, and the crew in the forecastle. Water ballast is provided for aft in cellular bottom and in a deep hold tank amidships. All the necessary requirements to fit the vessel for general and grain cargoes are complied with, and all the most modern improvements for the safe handling of the vessel, and rapid loading and discharging of cargo, are supplied and fitted throughout. The vessel is designed to load a deadweight of 5,700 tons on about 23 ft. mean draught. The engines, which are also being constructed by the Palmer Co., are of the triple-expansion surface-condensing type, with cylinders 24 in., 40 in., and 64 in. by 45 in. stroke, steam being supplied by two boilers 16 ft. diameter by 11 ft. long, with a working pressure of 180 lbs. The vessel, which is named *Dragoman*, has been built under the supervision of Mr. Maxwell Hill, consulting engineer, of Newcastle, and is the first of two building for Messrs. The Bedouin Steam Navigation Co., of Liverpool.

Harlingen.—On Thursday, March 10th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer which they have built to the order of Messrs Smith & Scaramanga, of London. She will take Lloyd's highest class, and is of the following dimensions:—Length, 329 ft.; breadth, 46 ft.; depth, 23 ft. 6 in. The deck erections consist of a poop, bridge over machinery space, and topgallant forecastle. A handsome saloon and cabins for officers, &c., will be fitted in the poop, the engineers' rooms in the bridge, and the crew's accommodation forward. The hull is built on the web frame principle, with a cellular double bottom, large hatchways, powerful steam winches, steam steering gear amidships, hand screw gear aft, patent donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner rig, and a complete outfit for first-class cargo vessel. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply triple-expansion engines having cylinders, 23 in., 36½ in. and 62 in. diameter, with a 39 in. piston stroke, and two large steel boilers to work at 160 lbs. pressure per square inch. The ceremony of christening the steamer *Harlingen* was gracefully performed by Miss Brydon, of Hartlepool.

Joseph Holland.—On March 10th there was launched by Messrs. John Blumer & Co., at Sunderland, a screw steamer, built to the order of Mr. F. C. Holland, London. Her dimensions are:—Length, 264 ft.; breadth, 39 ft.; depth, moulded, 19 ft. 5 in.; and she has been built on the deep frame system. The engines and boilers are being built by Messrs. George Clark, Limited, of Sunderland. The christening ceremony was performed by Mrs. Holland, of London, who named the vessel *Joseph Holland*.

Ushaw.—On March 10th Messrs. Short Bros. launched from their shipbuilding yard at Pallion, Sunderland, a handsomely modelled steel screw steamer of the following dimensions:—Length, 314 ft.; breadth, 45 ft.; depth, moulded, 23½ ft. This vessel has been constructed under special survey to the highest class in Lloyd's register, and is specially designed to carry a large cargo on a shallow draught of water. There are no obstructions in the holds, deep framing and side stringers being substituted for beams, this leaving the holds perfectly clear. There are four cargo hatchways with six powerful steam winches, steam being supplied by a large horizontal donkey boiler. The vessel has a short full poop, long bridge amidships, and topgallant forecastle. Accommodation for captain, officers and engineers is fitted in houses on the bridge deck, the saloon being handsomely fitted up in polished oak. Steam steering gear is fitted at the after end of the engine platform, with controlling rods to wheelhouse on flying bridge, also powerful screw gear on poop deck. The double bottom is constructed on the cellular principle and is divided into trimming tanks for water ballast. The engines, by Messrs. William Allan & Co., Limited, of Sunderland, are on the triple-expansion principle, having cylinders 24 in., 40 in., and 66 in. diameter, with a stroke of 42 in., steam being supplied by two large steel boilers having a working pressure of 160 lbs. On leaving the ways the vessel was named the *Ushaw*, the ceremony being performed by Miss Taylor-Smith, daughter of Dr. James Taylor-Smith, of Middleton Tyas, chairman of the company. During construction the vessel has been superintended by Captain Needham on behalf of the owners, the Durham Steam Shipping Co., Limited, of Newcastle-on-Tyne, and he will take command on completion of the vessel.

Sarpedon.—On March 7th there was launched at Hull an iron steam ketch of 160 tons gross, named the *Sarpedon*. She is owned by the Standard Steam Fishing Co., Limited, Hull.

Frederick Knight.—On March 10th Messrs. John Readhead & Sons launched from their shipbuilding yard, West Docks, South Shields, a screw steamer, built to the order of Messrs. W. H. & C. T. Jones, Cardiff. The vessel, which is 353 ft. in length over all, 45 ft. 6 in. broad, and 27 ft. 4 in. depth, moulded, is of the improved single-deck type, and classed 100 A1 at Lloyd's under special survey. She has a deadweight carrying capacity of about 5,850 tons on a light draught. The steamer will be fitted with triple-expansion engines, also constructed by Messrs. John Readhead & Sons, having cylinders 24 in., 40 in., and 65 in., with 45 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. As the vessel left the ways she was named the *Frederick Knight* by Miss Knight, of Birmingham.

Rambler.—On March 12th there was launched at Hull an iron steam ketch of about 165 tons gross named the *Rambler*. She is owned by Messrs. J. Duncan, Sons & Co., Hull.

Gloria.—On March 21st there was launched by Messrs. Eltringham & Co., at South Shields, a screw trawler of the following dimensions:—Length, between perpendiculars, 96 ft.; breadth, moulded, 19 ft.; depth, moulded, 11 ft. The engines have cylinders 16 in. and 34 in., and stroke 22 in. She has been built to the order of the Wear Steam Fishing Co., Limited, and was named *Gloria*.

Mercia.—On March 21st there was successfully launched from the shipbuilding yard of Messrs. Wood, Skinner & Co., Limited, at Bill Quay, Newcastle-on-Tyne, a very finely modelled steel and iron screw trawler of the following dimensions, viz.:—Length, 93 ft.; breadth, 18 ft. 6 in.; depth, 10 ft. 6 in. She is fitted with all the latest improvements for boats of her class, including a powerful steam trawl winch, and has been constructed under Lloyd's special survey to attain the highest classification certificate. She will be fitted by Messrs. Baird and Barnsley, North Shields, with a set of compound surface-condensing engines, having cylinders 14 in. and 30 in. diameter respectively, with a stroke of 21 in., steam being supplied from a steel multitubular boiler, working at 130 lbs. pressure. She has been built to the order of Mr. Richard Irvin, Mayor of Tynemouth, for the Irvin Steam Fishing Co., Limited, of North Shields. As the vessel left the ways she was named *Mercia* by Miss Irvin, of North Shields.

Asama.—On March 22nd there was launched at the Elswick shipyard of Sir W. G. Armstrong, Whitworth & Co., Limited, the first-class armoured cruiser *Asama*, built for the Imperial Japanese Navy. The new cruiser is 408 ft. in length between perpendiculars, her moulded breadth is 67 ft., her depth is 41 ft., her mean draught is 24 ft. 3 in., her displacement will be 9,750 tons, and her coal capacity 1,300 tons. The contract speed is 21¼ knots, but 21½ knots is expected.

Incemore.—On Tuesday afternoon, March 22nd, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer, of the following dimensions:—Length, over all, 342 ft.; breadth, extreme, 46 ft.; depth, moulded, 26 ft. 9 in.; tonnage gross, 3,220 tons. The vessel, which has been built to the order of Messrs. W. Johnston & Co., Limited, of Liverpool, will class 100 A1 at Lloyd's under special survey. She is of the single deck type, with short poop aft, long bridge amidships, with engineers' accommodation in after end, captain and officers being berthed in a large house on bridge deck, and crew in topgallant forecastle. A cellular double bottom throughout and peaks are fitted for water ballast, and equipment includes six steam winches, large multitubular donkey boiler, by Messrs. Blair & Co., steam windlass, stockless anchors, steam steering gear, double derricks, to all hatches, etc., etc. The engines, by Messrs. Blair & Co., Limited, are triple-expansion, having cylinders 22½ in., 39½ in., and 67 in. by 42 in. stroke, steam being supplied by two single-ended boilers with a working pressure cf 200 lbs. The vessel was named *Incemore*.

Febrero.—On Tuesday, March 22nd, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer, built to the order of Messrs. Campania Bilbaina de Navegacion of Bilbao, and of the following dimensions, viz.:—Length, 290 ft.; breadth, 43 ft.; depth 22 ft.; and to class 100 A1 at Lloyd's on the partial awning deck rule. This vessel has water ballast fitted right fore and aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including four double-cylindered steam winches, direct-acting steam windlass, large donkey boiler, steam steering gear by Messrs. John Hastie & Co., and Hastie's screw gear aft. The engines, which are supplied by Messrs. The North-Eastern Marine Engineering Co., Limited, are of the triple-expansion type, having cylinders 22½ in., 37 in., and 61 in., by 39 in. stroke, and working at a pressure of 160 lbs. On leaving the ways the vessel was named the *Febrero* by Miss Netta Hopper, of Gosforth.

Azul.—On Tuesday, March 22nd, Messrs. Wm. Gray & C . Limited, launched a fine large steel screw steamer, which they have built to the order of the Buenos Ayres & Great Southern Railway Co. and Messrs. Arthur Holland & Co., London. She is specially designed to carry a very large number of cattle and sheep on her decks, and a large measurement cargo in her holds. She will take Lloyd's highest class, and is of the following dimensions, viz.:—Length over all, 336 ft.; breadth, 48 ft. 9 in.; and depth, 24 ft. The deck erections consist of a full poop, long bridge, and topgallant forecastle. The saloon and captain's and officers' rooms, and passengers' accommodation, will be fitted on the bridge. The hull is built with deep frames, cellular double bottom for water ballast, and large after-peak tank, six steam winches, steam steering gear amidships, and a screw-gear aft, patent direct steam windlass, marine type donkey boiler, stockless anchors, and a complete outfit will be fitted for a first-class cargo boat. Three cylinder triple-expansion engines of first-class make are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited. They will develop over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., and fine extra steel boilers, having a pressure of 180 lbs. per square inch, will give an ample supply of steam. The construction of the ship has been under the superintendence of Mr. George Walker, of London, on behalf of the owners, and the ceremony of christening the steamer *Azul* was gracefully performed by Mrs. Pettigrew, of St. Andrew's, daughter of Sir William Gray.

Umbre.—On Wednesday, March 23rd, Messrs. Wigham Richardson & Co. launched from their Neptune shipyard, Newcastle-on-Tyne, a finely-modelled steel screw steamer, which they are building to the order of the Cork Steamship Co., of Cork, for their Continental service, and which is the third steamer built by Messrs. Wigham Richardson & Co. for this company. The steamer is 255 ft. in length by 33½ ft. beam, and will be fitted with triple-expansion engines designed to drive her at a good speed. There is also very comfortable accommodation for a limited number of passengers, and the arrangements for working both the ship and cargo are of the most modern and improved type. The owners were represented at the launch by Captain Hore, of Liverpool, their marine superintendent, and by Mr. Flockhart, their superintendent engineer. As the vessel left the ways she was named the *Umbre*, the christening ceremony being gracefully performed by Miss Hore, daughter of Captain Hore.

Rathfran.—On March 23rd Messrs. Stephenson & Co., Limited, launched at Hebburn-on-Tyne a screw steamer for the Irish Channel trade of the following dimensions, viz.:—Length, 160 ft.; breadth, 25 ft.; and depth, 11 ft. 10½ in. The propelling machinery consists of a set of compound surface condensing engines, having cylinders of 20 in. and 42 in.

diameter, by 30 in. stroke. The vessel is of the raised quarter-deck type, and has been built to the order of Messrs. W. O. M'Cormick & Co., of Kingstown, co. Dublin. The vessel was christened the *Rathfran*.

Symra.—On March 23rd Messrs. Ropner & Son, Stockton-on-Tees, launched a steel screw steamer of the following dimensions, viz :—Length, between perpendiculars, 315 ft.; breadth, extreme, 44 ft. 6 in.; and depth, moulded, 23 ft. 4 in. The steamer has been built to the order of Bergen owners, and is of the single-deck type, with the builders' patent trunk, full poop, bridge, and topgallant forecastle. She will be fitted with triple-expansion engines by Messrs. Blair & Co., Limited.

H.M.S. Goliath.—On March 23rd, H.M. first-class battleship *Goliath* was successfully launched at Chatham. She is somewhat smaller than the *Majestic* type. Her length between perpendiculars is 390 ft., her extreme breadth 74 ft., draught 26 ft.: freeboard, forward, 22 ft. 6 in., aft 19 ft., and amidships 17 ft. Her displacement is 13,000 tons. Her bottom has been coated with Hartmann's Rahtjen's improved composition, "The Red Hand Brand." Harveyed steel is to be used for her armour. She will be propelled by twin screws, driven by two sets of triple-expansion engines, built by Messrs. John Penn & Sons, and supplied with steam from twenty Belleville boilers, placed in three watertight compartments. The cylinders of the engines are 30 in., 49 in., and 80 in. in diameter respectively, with a 14 ft. 3 in. stroke. The twin screws are 17 ft. in diameter, and arranged so that the pitch can be varied. Her contract speed is 18½ knots. Like vessels of the *Majestic* type, she carries four 12 in. 46-ton guns in two barbettes, covered by thick hoods or shields, twelve 6-in. quick-firing guns, ten 12-pounder quick-firers, and the usual smaller pieces. The ship is fitted with two steel masts and 16 boats. The hull is constructed on the bracket system, and all work is made watertight to the height of the upper deck. Her complement is 750 officers and men.

Sunflower.—On March 24th Messrs. Day, Summers & Co., Northam Iron Works, Southampton, launched the steam yacht *Sunflower*, 300 tons B.M., which has been built to the order of Mr. Walter Greene, of Nether Hall, and has been designed by the firm. Her dimensions are :—Length between perpendiculars, 138 ft.; breadth, moulded, 21 ft.; depth, 12 ft. 8 in. The yacht is handsomely fitted throughout, the owner's state cabin, which is immediately abaft the engine-room, is a capacious apartment, extending the whole width of the vessel, being 12 ft. long. All the fittings in this cabin are of oak, and an oak dado of handsome design runs all round the cabin; the bulkheads above will be covered with decorated Lincrusta Walton. There are three large state cabins abaft the owner's cabin, and two forward of the machinery; these cabins have American walnut and American ash furniture and dado panelling. There are three bath-rooms for the use of the owner and his guests. The dining saloon is situated in a large deckhouse aft, this saloon being 18 ft. long and 11 ft. wide. There is another deckhouse forward, the front part of which contains the smoking-room; abaft this being a well-arranged lavatory, with handsome vestibule leading into both apartments. The accommodation for officers and crew, which is in the forepart of vessel, is exceptionally roomy and good. The machinery, which has also been designed and made by the firm, is of the most modern type, the engines being triple-expansion, and designed to run at a high speed. The boiler will be supplied with feed water by a pair of Weir's patent automatic feed pumps. The boiler is of extra large size, and is fitted with three Morison's suspension furnaces; the working pressure is to be 160 lbs. The yacht will be lighted throughout by electric lights, the electric plant being supplied by Messrs. Christian & Phipps. The yacht is to be fitted with Reid's steam windlass, Davis' steam steering gear amidships, and screw hand-gear aft; the boats are being supplied by Messrs. Summers & Payne. The yacht and machinery have been constructed to Lloyd's highest class, and built under special survey. The order for this yacht was placed with the firm the middle of November last, so that she has only been four months in course of construction; the engines and boiler, which are of 500 H.P., are also ready in the shops, and have been made in the same time. The yacht is expected to be completed and ready for the owner's use by the end of next month.

Steel Screw Steamer.—Lately there has been launched from the shipbuilding yard of Messrs. John Priestman & Co., Southwick, a large steel screw steamer of the following dimensions:—Length, 336 ft.; breadth, 47 ft.; and the moulded depth is 26 ft. 10 in., and she has been built to Lloyd's highest class. The engines and boilers are built by Messrs. Wm, Allan & Co., Sunderland, the cylinders being 25 in., 41 in., and 67 in. diameter by 45-in. stroke, steam being supplied by two large single-ended boilers at a working pressure of 160 lbs. per square inch. The launch was in every way successful, and the vessel was named by Mrs. John Priestman. The vessel has been built to the order of Mr. W. Leatham Bright, of London, and is a sister ship to the *Ursula Bright*, built last year for the same owners.

Stanley.—Lately Messrs. Fellows & Son have launched at Yarmouth for a London firm, another 50 ton steel barge. The new vessel is decked in, 54 ft. in length by 16 ft. beam, and 5 ft. depth of hold. She was named the *Stanley*.

Pecheries Ostendaises V.—Lately Messrs. Cochrane & Cooper, Limited, launched at Beverley, a new steam trawler, 102 ft. by 20 ft. by 11 ft. which has been built to the order of the Société Anonyme Pecheries Ostendaises. The vessel will be fitted with triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull. She was christened the *Pecheries Ostendaises V.*

Kildonan.—Lately Messrs. William Pickersgill & Sons launched at Sunderland a new cargo steamer, named the *Kildonan*, of about 3,600 tons deadweight, to the order of Messrs. John Cory & Sons, of Cardiff. She is of the improved single-deck type. Her dimensions are:—Length, 286 ft.; breadth, 43 ft. 1 in.; depth, moulded, 21 ft.; and her engines, which are being built by Messrs. George Clark, Limited, have cylinders 21 in., 35 in., and 57½ in. by 39-in. stroke.

LAUNCHES—Scotch.

Castor.—On February 18th the Campbeltown Shipbuilding Co. launched a steel-screw steamer of 1,950 tons deadweight. Her dimensions are:—Length, 238 ft. 6 in.; breadth 32 ft. 8 in.; depth, 17 ft. 6 in. The vessel is intended to trade between London and the Baltic during the summer months, and for general merchant service when the Baltic is closed. She is for a firm of Russian shipowners, and was named *Castor*.

Chin Kiang.—On February 21st Messrs. Scott & Co. launched at Greenock a steel screw steamer named *Chin Kiang* for the China Navigation Co. She is the first of six steamers they are building for the same company. The dimensions are:—Length, 275 ft.; breadth, 38 ft.; depth, 22 ft. 6 in.; of 2,100 tons gross, 2,700 tons carrying capacity. The builders will supply triple-expansion engines, the cylinders of which will be 20 in., 32 in., and 52 in. in diameter, with a piston stroke of 39 in.

Kenilworth.—On February 22nd Messrs. A. & J. Inglis launched from their yard at Pointhouse a steel paddle steamer of about 300 tons, for the North British Steam Packet Co. The vessel is intended for the Craigendoran-Rothesay route, in connection with the North British Railway trains. She is 215 ft. long by 22 ft. broad, and will be supplied with engines of over 1,700 I.H.P., from which a speed of 19 knots is expected. Except in a few details the *Kenilworth* is similar to the company's steamer *Talisman*. The vessel was christened *Kenilworth* by Miss Norah Darling.

Holland II.—On February 22nd another trawler was launched at Aberdeen, the vessel having been built by Messrs. John Duthie, Sons & Co. for a Dutch firm. She was named *Holland II.*, and will be registered at the port of Amsterdam. The vessel is fitted with triple-expansion engines of 320 I.H.P. and with all latest improvements for trawl fishing.

Valetta.—On February 22nd Messrs. Archibald M'Millan & Sons, Limited, Dumbarton, launched a steamer which has been built to the order of Messrs. Gow, Harrison & Co., of Glasgow. Her dimensions are:—370 ft. by 46 ft. by 58 ft. 6 in., and the carrying capacity 6,200 tons. The vessel and machinery have been built to Lloyd's highest class three-deck rule, and under the superintendence of Mr. George M'Farlane, Glasgow. The ceremony of naming the vessel *Valetta* was performed by Mrs. J. R. Harrison.

Oihonna.—On February 23rd Messrs. Gourlay Brothers & Co. launched at Dundee the steamer *Oihonna*, which they have built for the Finska Steamship Co., Finland. Her principal dimensions are:—Length, 200 ft.; breadth, 31 ft. 3 in.; depth, 23 ft. 3 in.; and her gross tonnage 1,025. The stem and stern are peculiarly shaped and stiffened for forcing the ice. She is of the awning-deck type, and has been constructed to the highest class in Lloyd's Registry. The *Oihonna* is like her sister ship the *Wellamo* in every respect, and is to be engaged in the passenger trade on the Baltic.

Braemar Castle.—On February 23rd Messrs. Barclay, Curle & Co., Limited, launched at Whiteinch, the *Braemar Castle* a screw steamer of about 6,200 tons gross, built for the intermediate service of the Castle Mail Packets Co., Limited. The hull is built of steel throughout to the requirements of the Board of Trade for a foreign-going passenger steamer, and also under special survey with scantlings to Lloyd's latest rules for the 100 A1 class. An important feature in the construction of the steamer is the number and disposition of the new bulkheads, which have been so placed as to practically insure the safety of the ship, while the double collision bulkhead forward provides a further safeguard against the dangers of collision. The cellular double bottom also adds greatly to the strength and safety of the ship, while it provides ample water ballast for the homeward voyage, when light wool cargo is largely carried. Her dimensions are as follows:—Length over all, about 470 ft.; length on waterline, 450 ft.; breadth, extreme, 52¼ ft.; depth, moulded, 33½ ft.; depth, hold, 30½ ft. The vessel will have accommodation for over 70 first-class passengers, berthed forward of the machinery space on the upper and bridge decks; 130 second-class, amidships on main and upper decks; and 160 third-class, berthed aft in 'tween decks and in poop; while the remainder of the 'tween decks has been fitted so as to be available either for additional third-class passengers or for transport service. All the cabin accommodation is exceptionally commodious, most of the staterooms being fitted for two persons. Some are for single passengers, while others are arranged as family cabins for four, with doors communicating from one room to the other. The first-class entrance is at the forward part of the bridge deck and leads from the promenade deck down into a dining saloon for children in the 'tween decks. The first-class saloon itself is a spacious compartment, panelled in selected oak, with a handsome cupola overhead in centre, and large square windows with ventilators over them. The cabins are exceptionally well lighted and ventilated, as in addition to the natural ventilation throughout the ship a complete system of mechanical ventilation has been fitted, consisting of electrically-driven fans, which will ensure a constant stream of fresh air passing through the passenger accommodation. In the tropics this arrangement of fan ventilation will add considerably to the comfort of the passengers. The smoking-room, also placed amidships on the same deck, is of capacious dimensions, with a high roof, and will be panelled in hardwood and fitted with lounges. The second-class accommodation comprises a main saloon and children's dining saloon, smoke-room, &c., which, although perhaps not so luxurious as the first-class, is finished substantially in hardwood and provided with every requisite. Pianos by the best makers, specially built and designed to harmonise with the furniture and cabinet work, will be supplied in both first and second-class saloons. An extensive library will also be provided for both first and second-class passengers. The third-class passengers have large airy dining saloons, and state-rooms aft, of various sizes, which will accommodate from two to eight people each, and which will be fitted up in a plain but comfortable manner. The refrigerating machinery is by Messrs. J. & E. Hall, Limited, and consists of one of their CO_2 machines of ample power and of the duplex type, thus practically ensuring freedom from risk of breakdown. The propelling machinery is of the quadruple-expansion type balanced on the Yarrow, Schlick, and Tweedy system. The shafting throughout is of hydraulic forged fluid compressed steel, made by Messrs. Armstrong, Whitworth & Co., Limited. In the arrangement of the machinery, duplication of the connections has been fully carried out, to minimise the risk of breakdown. The launching ceremony was performed by Mrs. Murray, wife of the Hon. W. Murray, of Natal.

Argo.—On February 24th there was launched from the yard of the Caledon Shipbuilding and Engineering Co., Limited, Dundee, the first of four passenger and cargo steamers being built to the order of Messrs. Thomas Wilson, Sons & Co., Limited, Hull. She has been built to Lloyd's highest class special survey, and to Board of Trade requirements. Her dimensions are:—Length, over all, 231 ft. 6 in.; breadth, 32 ft; depth in hold, 14 ft. 6 in. The engines are of the triple-expansion type, having cylinders of 18 in., 30 in., and 50 in. diameter respectively, with a piston stroke of 36 in. As she left the ways the *Argo* was christened by Mrs. J. F. Wilkins, the launching ceremony being performed by Miss Brown, Craigmount, Broughty Ferry.

Ujina.—On February 24th there was launched at Dumbarton for the British India Steam Navigation Co., of Glasgow, a steel steamer of about 5,310 tons, named the *Ujina*.

Norseman.—On February 24th there was launched from the shipbuilding yard of Messrs. David and William Henderson & Co., Partick, a very handsomely modelled auxiliary steam yacht, which they have built to the order of S. R. Platt, Esq., of Oldham. The vessel has been designed by Mr. St. Clare Byrne, naval architect, Liverpool, under whose superintendence she has also been constructed. The dimensions of the vessel are:—Length, over all, 184 ft.; breadth, 27 ft.; and depth, 17 ft. 7 in., with a tonnage of about 520 tons yacht measurement. The hull of the vessel is of steel, and she has been constructed so as to obtain Lloyd's class 100 A1, under special survey. Internally the vessel has been fitted in a most handsome and luxurious manner, the upholstery and cabinet work of the principal saloon and staterooms being undertaken by Messrs. Waring & Co., of Liverpool. All the cabin accommodation below has been arranged with a view to excellence and comfort, and the woods used in the decoration of the different apartments are of the choicest description. The deckhouses, which contain a saloon forward, and also one aft, have also been treated in a first-class manner, and generally the whole of the accommodation has been executed in a most artistic and effective style. The captain, officers and crew occupy the forward portion of the vessel, and the accommodation allotted to them is in itself extremely neat and well fitted. The vessel is fitted with three masts of Oregon pine and will be rigged as a three-masted topsail schooner, thus giving her a very large spread of canvas. The sails have been supplied by Messrs. Lapthorn & Ratseys, of Cowes. She will, however, not rely completely on her canvas for progress, for the builders have fitted her with a set of compound engines, capable of driving her at a speed of 11 knots an hour. A most complete installation of electric light has been fitted throughout by Messrs. J. P. Hall & Co., Oldham, with an arrangement of cells for the storage of electricity to avoid the necessity of running the dynamo at night. A set of high-class boats, including a steam launch, have been supplied by Messrs. Camper & Nicholson, of Gosport. The vessel is a most artistic addition to the auxiliary class, and nothing has been spared to make her at once a handsome and comfortable ship. As she left the ways she was very gracefully named *Norseman* by Master John Rookhurst Platt.

Johanna.—On Saturday, February 26th, Messrs. Carmichael Maclean & Co., shipbuilders, Greenock, launched from their shipbuilding yard a steel screw steamer of the following dimensions:—230 ft. by 34 ft. by 16 ft., moulded, to main deck, gross tonnage 1,200. She is to the order of a Dutch firm. This vessel has a raised quarterdeck and topgallant forecastle, and is to ballast with water in a double bottom. The machinery consists of triple-expansion engines, with cylinders 17 in., 27½ in., and 44 in., by 33 in. stroke, steam being supplied from a large boiler working at 160 lbs. pressure. All the usual appliances for the rapid loading and discharging of cargo have been fitted on board this steamer, and in all respects she is most thoroughly equipped for the Rotterdam and Cardiff trade, for which she is intended. At the lunch afterwards the usual toasts were duly honoured. The vessel and her machinery has been built under the superintendence of Mr. G. H. Strong, M.I.N.A., consulting engineer, Hull, and will be commanded by Captain R. Dobbenga. On leaving the ways she was named the *Johanna*.

Nordhavet.—On February 28th Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel-screw steamer of about 2,100 tons net register tonnage and 3,350 tons gross tonnage, and to carry about 5,200 tons deadweight, for the Norden Steamship Co., of Copenhagen. The vessel is intended for the American and general trade. The following are the principal dimensions:—Length, between perpendiculars, 330 ft.; breadth, 45 ft. 6 in.; depth, moulded to spar deck, 26 ft. 6 in. The vessel has been built to the highest class at Lloyd's on the deep frame system, and is fitted throughout with a double cellular bottom for water ballast, deep tank amidships and after peak also being utilised for this. The vessel is schooner rigged, and the topmasts are made to telescope so that the vessel can pass under the bridges on the Manchester Canal. The accommodation for the officers and crew are of the most complete description, the saloon, captain's room, and two spare state-rooms being in large deckhouse on bridge deck. The saloon is panelled in polished mahogany with tastefully-carved pilasters and upholstered in morocco leather. The officers' and engineers' rooms are housed alongside engine casing, and are replete with every comfort, while the crew are berthed under the topgallant forecastle. The machinery, which is being supplied by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system. The cylinders are 24 in., 40 in., and 65 in. diameter, by 42 in. stroke, steam being supplied by two large boilers working at 180 lbs. pressure. As the vessel left the ways she was gracefully named the *Nordhavet* by Mrs. John Harvey, of Bencluths, Port-Glasgow.

R. H. B. Thomson, Amber, and Cameo.—On March 5th Messrs. Mackie & Thomson, Govan, launched three trawlers—the *R. H. B. Thomson*, of 185 tons, with engines of 420 I.H.P., for Messrs. J. Leyman & Co., Hull; the *Amber* and *Cameo*, each of 195 tons, and with engines of 360 I.H.P., for the Kingston Steam Trawling Co., Limited, Hull. The engines, which are all triple-expansion, have been supplied by Messrs. Muir & Houston, Kinning Park.

Greville Vernon.—On March 8th Messrs. A. Rodger & Co., launched at Port-Glasgow, a twin steel screw tug of the following dimensions:—Length, 105 ft.; breadth, 21 ft. 3 in.; and depth, 10 ft. 6 in. She has been built to the order of the Ardrossan Harbour Co., and will be engined by Messrs. Ross & Duncan, Glasgow. The ceremony of naming the steamer *Greville Vernon* was gracefully performed by Lady Edith Montgomery, second daughter of Lord Eglinton.

Uganda.—On March 8th a fine steel screw steamer for the British India Co. was launched by Messrs. Alex. Stephen & Sons at Linthouse, and named the *Uganda*, by Miss Stewart, daughter of Rev. Dr. Stewart, of Lovedale, South Africa. The *Uganda's* dimensions are 410 ft. by 50 ft. 6 in. by 31 ft. 9 in., and her engines have cylinders 26½ in., 42 in., and 66½ in., by 51 in. stroke. She in classed 100 A1 in Lloyd's with Board of Trade passenger certificate, and is a very good example of the highest class of modern cargo vessel, being fitted with the best appliances, and all the British India Co.'s specialties. She has been superintended by Captain Hodgkinson and Mr. Clark, and built under the personal supervision of Mr. Peter Barr, the company's local inspector.

Earnock.—On March 10th Messrs. J. M'Arthur & Co. launched at Paisley the second of two steel screw steamers they are building to the order of Messrs. Paton & Hendry, Glasgow, managers of the Glasgow Steam Coasters Co., Limited. These steamers have been specially designed and built for the coasting trade, and are exceptionally strong and well-equipped, being fitted with all the latest and best appliances for safe and quick handling of vessel and cargo. Powerful compound surface-condensing engines are to be fitted by Messrs. Shanks, Anderson & Co., Pollokshaws. The steamer was named *Earnock* by Mrs. Robertson, Uddingston.

Magic and Honoria.—On March 10th two steam trawlers were launched by the Dundee Shipbuilders' Co., Limited. The *Magic*, the first vessel to be set free, was christened by Mrs. Windialte, and has been built to the order of the Atlantic Steam Fishing Co., her dimensions being:—Length, 105 ft; breadth, 21 ft.; and depth, 12 ft. The *Honoria*, named by Mrs. Rushworth, is for the Rushworth Steam Fishing Co., and is slightly larger than the *Magic*, being 142 ft. long, 21 ft. 6 in. broad, and 12 ft. deep.

Ichang.—On March 10th Messrs. Scott & Co., shipbuilders, Greenock, launched the steel screw steamer *Ichang* for the China Navigation Co., Limited. The dimensions of the vessel are as follows:—Length, 275 ft.; breadth, 38 ft.; depth, moulded, 22 ft. 6 in. She is of 2,100 tons gross, with a carrying capacity of 2,700 tons. This vessel is the second of six steamers building for the same company by Messrs. Scott, will be supplied by the builders with triple-expansion engines, the cylinders being 20 in., 32 in., and 52 in., by 39 in. piston stroke.

Valentia and Yeovil.—On March 11th the Irvine Shipbuilding and Engineering Co., Limited, launched at Irvine two finely-modelled screw steam trawlers of 160 tons gross each, built to the order of Messrs. Hagerap, Doughty & Co., Grimsby. The steamers are built of steel to Lloyd's class, under special survey, and are fitted with the most modern improvements for their work in the North Sea. Their dimensions are:—110 ft. by 21 ft. by 11 ft. 7 in. moulded, and they are supplied by Messrs. Muir & Houston, Limited, Glasgow, with triple-expansion engines of about 250 I.H.P., having cylinders 10 in., 16 in., and 27 in. by 20 in. stroke, steam being supplied by a large steel boiler at 180 lbs. pressure. As the steamers left the ways they were respectively named *Valentia*, by Mrs. Wood Roger, Strathbungo, Glasgow, and *Yeovil*, by Miss Walker, Kelvinside, Glasgow.

Anselma de Larrinaga.—On March 12th Messrs. Russell & Co., shipbuilders, Port-Glasgow, launched from their Kingston yard a large steel screw steamer for the Atlantic trade of Messrs. Larrinaga & Co., Liverpool and Bilbao. The new vessel is of 6,300 tons deadweight carrying capacity on Lloyd's summer freeboard, and her dimensions are:—Length, 365 ft.; breadth, 47 ft.; and depth, 29 ft. 4 in. On leaving the ways the vessel was gracefully named *Anselma de Larrinaga* by Senora Larrinaga, wife of one of the owners. After the launch the steamer was towed to Glasgow, where Messrs. Dunsmuir & Jackson will supply the engines, with cylinders 25 in., 42 in. and 70 in. by 48 in. stroke.

Fluor.—On March 12th Messrs. Scott & Sons launched from their shipbuilding yard at Bowling, to the order of Mr. William Robertson, 15, Gordon Street, Glasgow, a screw-steamer of dimensions 200 ft. by 31 ft. by 14 ft. 2 in. Triple-expansion engines will be fitted on board by Messrs. Muir & Houston, Limited, Kinning Park, Glasgow. On moving down the ways the steamer was named *Fluor* by Miss Bryce Stewart, of Glasgow.

Angola.—On March 12th there was launched from the shipbuilding yard of Messrs D. & W. Henderson & Co., Partick, a large steel screw cargo steamer, which they have constructed to the order of Messrs. MacLay & McIntyre, Glasgow. This latest addition to the large fleet of vessels already owned by this firm is in length, 375 ft.; breadth, 50 ft.; with a depth of 28 ft. 3 in., having a gross tonnage of about 4,300 tons, and will be classed in Lloyd's 100 A1. She has been fitted with all the latest improvements to ensure the rapid and safe working of the large cargo which she has been designed to carry, including seven powerful winches, also large derricks fitted at the hatches, steam steering gear by Messrs. Bow, MacLachlan & Co., Paisley, is fitted amidships, the saloon and officers' accommodation is on the fore end of bridge deck, and a chart-room and wheel-house have been built above this, with a bridge which will give every facility to the officers in the navigation of the vessel. A set of triple-expansion engines will be supplied and fitted by the builders, having cylinders 25 in., 41 in., and 67 in diameter, by 4 ft. stroke. As the vessel left the ways she was gracefully named *Angola* by Mrs. Thomas C. MacLeod, Regent Park Square.

Queen Victoria.—On March 12th Messrs. Murdock & Murray, shipbuilders, launched from their yard at Port-Glasgow, one of two steam pilot steamers they are building for the Mersey Docks and Harbour Board, Liverpool. The dimensions of the vessel are:—Length, 128 ft.; breadth, 24 ft.; and depth, 13 ft. The vessel is fitted up in the most complete manner, having accommodation for forty pilots, and is, with some slight improvements, a duplicate of the pilot steamers *Francis Henderson* and *Leonard Spear*, launched in September 1896, by Messrs. Murdock & Murray for the same owners. On leaving the ways the steamer was named *Queen Victoria*, and was afterwards towed to Glasgow, to have triple-expansion engines, &c., fitted on board by Messrs. David Rowan & Son, which firm also engined the two previous vessels.

City of Birmingham and **City of Edinburgh**.—On March 14th Messrs. Mackie & Thomson, Govan, launched two steam fish carriers, named the *City of Birmingham* and the *City of Edinburgh*, which they have built for Messers. Hagerup, Doughty & Co., Grimsby. The vessels are each 148 ft. long, 23 ft. 6 in. breadth, 11 ft. 6 in. deep, and of 300 tons gross. They will be supplied with triple-expansion engines of 750 I.H.P. by Messrs Muir & Houston, and will be two of the largest carriers on the East Coast.

Steam Yacht.—On March 15th Mr. Thomas Orr, jun., yacht builder, Greenock, launched a steam yacht 68 ft. in length, 11 ft. in breadth, and 7 ft. in depth. The yacht was subsequently towed to the Clyde Patent Slip, where she will be engined by Mr Robert Montgomery.

David Fernie.—On March 19th Messrs. Murdoch & Murray launched from their yard at Port-Glasgow the second of two steam pilot boats they are building for the Mersey Docks and

Harbour Board, Liverpool. The vessel is the fourth Messrs. Murdoch & Murray have built for the same owners, and is an exact duplicate of the *Queen Victoria* launched on March 12th. On leaving the ways the steamer was named *David Fernie* and was afterwards towed to Glasgow to have her machinery fitted by Messrs. David Rowan & Son.

Caledonia and Cruiser.—On March 21st two steam trawlers were launched by Messrs. Hall, Russell & Co., Aberdeen. Both vessels, which were built to the order of Mr. Thomas Devlin, jun., Newhaven, are of the same dimensions, their length being 120 ft., breadth of beam, 20 ft. 6 in., and depth, 12 ft. They are fitted with compound surface condensing engines, the cylinders being 17 in. and 34 in., with 24 in. stroke. The vessels were named respectively *Caledonia* and *Cruiser*.

Cunaxa.—On March 21st Messrs. Russell & Co., Port-Glasgow, launched a steel spar-decked steamer *Cunaxa*, of 5,100 tons deadweight carrying capacity, built to the order of Messrs. William Thomson & Co., St. John, N.B. The vessel measures :—Length, 325 ft.; breadth, 48 ft.; depth, 25 ft. The machinery will be supplied by Messrs. Kincaid & Co., Greenock.

Steel Screw Steamer.—On March 22nd there was launched from the yard of the Campbeltown Shipbuilding Co. at French Point, the first of two steel screw steamers recently purchased by a Spanish firm of shipowners. The vessel, which has been built to the highest class at Lloyd's, is of 3,000 tons deadweight, and is designed for general trading. Her dimensions are :—Length, 280 ft.; breadth, 36 ft. 9 in.; depth, moulded, 20 ft. Triple-expansion engines will be supplied at Glasgow. The naming ceremony was performed by Miss Kincaid, Corrie Bank, Greenock.

Twin-screw Steamer.—On March 22nd the Fairfield Shipbuilding and Engineering Co., Limited, launched a handsome twin-screw steamer, built to the order of the Roumanian State Railways, for mail and passenger service between Constanza, Constantinople, and Alexandria. The principal dimensions are:—365 ft. by 42 ft. 3 in., by 29 ft. 2 in., and gross tonnage about 2,600 tons. The vessel is built to the highest class at Bureau Veritas, with special marks. She has a cellular double bottom adapted for carrying water ballast, a shade deck all fore and aft, with large deck-house amidships. Accommodation is provided for 65 first-class, 67 second-class, and 300 third-class passengers. The vessel will be rigged with two pole masts, and fitted with steam steering gear, steam windlass, and cranes for the expeditious working of the cargo. The machinery consists of two sets of triple-expansion engines, each set having three cylinders, 23½ in., 38 in., and 61 in. diameter by 3 ft. stroke. The high-pressure cylinders are each fitted with a piston valve; the medium and low pressure cylinders are each fitted with flat slide valves; all being worked by the usual double eccentric and link-motion valve gear. The reversing engines are of the steam and hydraulic direct-acting type. The condensers are of sheet steel, and separate from main engines, the circulating water being supplied by centrifugal pumps driven by independent engines. The engine-rooms are fitted with all modern appliances, and include evaporators for making fresh water for supplying the boilers, feed filters, and all the necessary fittings to ensure the most economical working. All the shafting is of forged Siemens-Martin mild steel. The propellers are fitted with manganese bronze blades, and are adjustable. Steam is supplied by two double-ended and two single-ended boilers, having a total of 24 furnaces, and arranged with one funnel. The boilers have been constructed under the Bureau Veritas and Roumanian Government regulations for 180 lbs. working pressure. The vessel, when completed, will be one of the fastest of her size afloat.

Ape.—On March 23rd there was launched from the shipbuilding yard of Messrs Barclay, Curle & Co., Limited, Whiteinch, Glasgow, the screw steamer *Ape*, built to the order of Messrs. G. & J. Burns, Glasgow, for their general trade between Clyde ports and Belfast. The vessel is built of steel of scantlings considerably in excess of Lloyd's requirements, and under their special superintendence, and that of Mr. Rae, the company's surveyor. She will be rigged as a schooner with two steel pole masts. Her dimensions are 175 ft. by 28 ft. by 13 ft. 9 in., with a gross tonnage of 400 tons. After the launch, the vessel was towed to the harbour to be fitted by the builders with her engines, which are of the triple-expansion type, with cylinders 15 in., 25 in., and 40 in. by 30 in. stroke, and will develop an I.H.P. of 600 horses.

E. M. Dalgas.—On March 23rd the Grangemouth Dockyard Co. launched successfully from their shipbuilding yard at Grangemouth a handsomely modelled steel single deck screw steamer, built to the order of Messrs. Svendsen & Christensen, of Copenhagen. The vessel has been designed to carry a deadweight of 2,500 tons on light draught, and will be fitted with all modern appliances for the quick working of cargo, steam windlass, steam steering gear, and is fitted with large water ballast capacity. The vessel is intended for general trade from Copenhagen, and is adapted for carrying large deck loads of timber when on the Baltic route. Triple-expansion engines will be supplied by Messrs. Hutson & Son, Kelvinhaugh, Glasgow. The launching ceremony was gracefully performed, and the vessel named *E. M. Dalgas* by Miss Klitgaard, daughter of Captain Klitgaard (who represented the owners at the launch). The vessel has been built under the superintendence of Mr. D. Smail, consulting engineer, Glasgow. The dockyard company are presently building another vessel for the same owners.

Mount Cenis and Mount Blanc.—On March 23rd there was launched from the shipbuilding yard of Messrs. Cumming & Ellis, Inverkeithing, the first two vessels for the new fleet building by them for the Messrs. Muirheads Trawlers, Limited, Granton. The dimensions of the vessels are 109 ft. by 21 ft. by 11 ft. 9 in., and are fitted with triple expansion engines having cylinders 12½ in., 20 in., and 32 in. by 24 in. stroke. Steam is supplied from large boilers working at 100 lbs. pressure. The vessels are fitted with all modern improvements used in connection with fishing with the new Otter gear, a double set of which has been supplied by the builders. Double-barrelled steam winches are also fitted on board each vessel. The accommodation for officers and crew is fitted aft and forward, the after accommodation being in polished hardwood and neatly upholstered. Special rooms are fitted for the captain and engineers. The accommodation forward for crew and firemen is fitted in pine and gracefully grained. The vessels are both built of steel 20 per cent. in excess of Lloyd's requirements, and as they are intended for fleeting, the builders have kept in view the excessive strain they are subject to while at work and have strengthened them in the parts most liable to strain. The shell plating for half the vessels' length amidship is double at the load line and heavy cope irons are fitted outside the doubling plates. On leaving the ways the vessels were named *Mount Cenis* and *Mount Blanc* by Miss Muirhead, daughter of the managing director of the company.

LAUNCHES.—Irish.

City of Corinth.—On February 22nd Messrs. Workman, Clarke & Co. launched at Belfast a cargo and passenger steamer, built to the order of the City Line, Limited, of Glasgow. The new steamer has a gross tonnage of close on 5,000 tons, and will be engaged in the Eastern trade. She was named the *City of Corinth*.

Indore.—On March 10th there was launched from the shipbuilding yard of Messrs. Workman, Clarke & Co., Limited, a large steel screw steamer, built to the order of Messrs. Edward Bates & Son, Liverpool. She has been specially designed for their trade, and is built in excess of Lloyd's requirements and having Board of Trade passenger certificate, and fitted out to comply with American passenger regulations. The dimensions are as follows :—Length, 480 ft.: breadth, 52 ft.: depth, moulded, 38 ft.; with a gross tonnage of 7,300, and the vessel is capable of carrying, on Lloyd's draught, a deadweight of about 8,800 tons. The new steamer was named the *Indore*, and will be engaged principally in the trade between Liverpool and American ports, and is the largest vessel under Messrs. Bates' flag. The upper deck, also poop, bridge, and forecastle, are of chequered iron, and complete main and lower decks of steel extend fore and aft with orlop tier of beams below. Cattle, amounting to upwards of 800 head, are carried on the upper and bridge under shelter decks, and on these, several thousand sheep can be arranged in pens. There are nine hatches arranged for the most expeditious loading and discharging of cargo, with gangway doors opposite in the side of shelter deck. The rooms for the captain and officers is in a large saloon house tastefully fitted up on the bridge, and suitable quarters are provided for the leading cattlemen and their assistants, all heated by means of steam. Two complete electric plants for lighting up the vessel throughout on the most approved principle will be supplied by Messrs. W. H. Allen & Co. A powerful steam steering gear is placed in a wheelhouse on the poop of Harrison's make, and controlled from the flying bridge. The machinery is capable of indicating up to 4,500 H.P., and is of the most modern type of triple-expansion engine, having cylinders 29½ in., 50 in., and 82 in.; stroke, 60 in. Steam is supplied at a pressure of 200 lbs. from four large steel boilers fitted with patent furnaces. After the launch the *Indore* was towed to the finishing berth.

TRIAL TRIPS.

Paris.—On February 19th the screw steamer *Paris*, built by Messrs. Wood, Skinner & Co., Limited, Bill Quay-on-Tyne, to the order of Messrs. F. Strick & Co., London, left the Tyne, fully laden, on her official trial trip. This vessel is of the following dimensions;—Length, 230 ft.; breadth, 32 ft.; depth, moulded, 16 ft. 6 in.; and is intended for a special trade from Cardiff to continental ports. A special feature in connection with the steamer is the small register tonnage of the vessel compared with the deadweight carried. The register tonnage is only 507 tons, and the vessel carries 1,500 tons. The engines, which have been built by the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne, are of the triple-expansion type, with cylinders 21 in., 34 in., and 56 in., by 36-in. stroke, and during the trial worked to the entire satisfaction of the owners and their representatives. The speed of the ship, though the sea was very rough, was 10¾ knots, which was considered very satisfactory.

Victory.—On February 22nd a successful trial trip took place of the steamer *Victory*, which has been built for the Britannia Steam Fishing Co., Limited, of that port, by Earle's Shipbuilding Co., of Hull. After an easy run down the Humber and adjusting the compasses, a stoppage was made at Grimsby, where the owner's party joined the ship. The results of the tests were highly satisfactory in all respects, the working of the engines and boiler being all that could be desired. The speed of the vessel was 10½ knots.

Presidente Sarmiento.—On February 22nd the training ship *Presidente Sarmiento*, built to the order of the Argentine Republic by Messrs. Laird Brothers, of Birkenhead, went for her preliminary trial trip, and was kept under steam for about six hours, proceeding out to the Mersey Bar.

Berry.—On February 26th the screw steamer *Berry* went down the Mersey for her official trip, after having had her machinery converted to high pressure compound by Messrs. David Rollo & Sons, Fulton Engine Works, Liverpool. She has two double-ended boilers each 11 ft. diameter by 16 ft. 6 in. long, built of steel to the requirements of Bureau Veritas for a working pressure of 160 lbs. per square inch. Each boiler has four Purves' patent flues, made on the late Mr. Ashlin's patent interchangeable plan, and is also fitted with his very effective water circulator. The new cylinders are 24 in. and 63 in. diameters respectively by 42 in. stroke, intended to indicate in ordinary working service 1,200 H P., the vessel maintaining an average speed of 12 knots. The *Berry* is a vessel of 1,600 tons register, her dimensions being 255 ft. by 34 ft by 16 ft., and is one of the fleet of the Societe Generale de Transports Maritimes à Vapeur of Marseilles. The alterations have been carried out to the specifications of Messrs. Ashton & Co., of Glasgow. Messrs. H. E. Moss & Co, who have been the company's representatives in this country for between 30 and 40 years, were represented at the trial trip by Mr. E. A. Cohen, Mons. Lamtinet, the company's superintendent engineer, being also present. Mr. L. Murphy, representing the United States Metallic Packing Co., whose packing was supplied to the *Berry*, was also on board, and was congratulated as to its merits. Advantage was taken during the lay up to fit steam steering gear, a "Higginson's" steam quartermaster replacing the original hand gear. The trial proved in every way perfectly satisfactory, the consumption of coal being much less than before, whilst the speed was considerably increased, thus showing the advisability and economy attached to the conversion of ordinary compound engines to the high pressure compound type.

Goldfinder.—On February 26th the new steam trawler *Goldfinder*, built by Messrs. Cochrane & Cooper, of Beverley, to the order of Mr. E. M. W. North, of Grimsby, went on her trial trip. The vessel is 100 ft. long, 20 ft. beam, and 11 ft. 6 in. depth of hold. Everything passed off satisfactorily, a speed of 10½ knots per hour being registered.

Stilbe.—On February 28th the loaded trial took place of the new French steamer, *Stilbe*, built by Messrs. John Blumer & Co., Sunderland, for Messrs. A. C. Lequellec & Fils, of Bordeaux. The vessel has been specially designed for the wine trade by Messrs. W. Esplen & Son, of Liverpool, and was engined by Messrs. John Dickinson & Sons, Limited. On five consecutive runs on the measured mile she attained a mean speed of 11 knots, and at the conclusion of her trial the *Stilbe* proceeded to Algiers.

Florence.—On March 3rd the screw steamer *Florence*, of Liverpool, built by S. M'Knight & Co., Limited, Ayr, after adjusting compasses, proceeded up the Firth of Clyde to undertake her speed trials; the owner, Captain Rowland, of Liverpool and Runcorn, together with a large party of friends and the builders' representatives being on board. After a good run up the Firth the vessel was put on the measured mile at Skelmorlie, and a series of six consecutive runs was made. The vessel attained a mean speed of 10·85 knots, which was exceedingly satisfactory, especially in view of the fact that she was fully laden. The machinery worked perfectly throughout the whole trial, which lasted, on the whole, nearly 12 hours, including voyage to and from Ayr. The *Florence* has been built to the highest class at Lloyd's under special survey, and her dimensions, &c., are as follows:—Length, 140 ft.; breadth, 24 ft.; depth of hold, 9 ft. 8 in.; deadweight carrying capacity, about 400 tons. The vessel has been specially designed to economically meet the requirements of the owner's trade, and is of the raised quarterdeck type, with all modern improvements. She is fitted with steam steering gear, windlass, &c., steam winch, and has accommodation for officers and crew of much superior description to that usually found in vessels of this type. Her engines are of the compound surface-condensing type, with large single-ended boiler working at 120 lbs. pressure, and have been built by the well-known firm of Ross & Duncan, Govan. The vessel and machinery have been built under the special superintendence of Mr. E. Kennaugh, of Liverpool, acting on behalf of the owner. On completion of the trials, the owner expressed himself exceedingly satisfied at the results attained and at the excellent completion and finish of the vessel. After coaling, the *Florence* proceeded on her maiden voyage to Liverpool.

H. M. S. Wolf.—On March 9th H M.S. *Wolf* completed her official full-power speed trials on the Clyde in the presence of the Admiralty representatives. Six runs were made on the measured mile with the following results:—

	Steam.	Time.	Speed.
1st mile	211	1.58 1.5	30 46
2nd mile	212	1.56 1.5	30 98
3rd mile	222	1 55 1.5	31·25
4th mile	215	1.54 3.5	31·41
5th mile	223	1.55 1.5	31·25
6th mile	208	1.55 3.5	31·14

The mean speed thus realised was 31·2 knots. After completing the six miles, the vessel was taken outside the Cumbrae to complete the three hours' steaming at her contract speed of 30 0 knots, which was easily obtained; the results at the finish shewing a speed of considerably over a quarter of a knot in excess of the contract. After completion of this trial, the usual steering trials at full speed ahead and astern were carried out, and the stopping, starting, and reversing of the engines demonstrated for efficiency. The Admiralty were represented by Messrs. Welch and Wisdom; Devonport Dockyard, by Messrs Rider and Barry, and the chief engineer of the vessel, Mr. Glanville, was also present. Mr. R. Ratsey Bevis, jun., and Mr. Roy M. Laird, represented Messrs. Laird Bros., the contractors. The *Wolf* is the tenth 30-knot destroyer that Messrs. Laird have now completed for the British Admiralty.

Ronan.—On March 12th the s.s. *Ronan*, 1,200 tons gross, built by Messrs. Ramage & Ferguson, Limited, Leith, for Messrs. George Gibson & Co., of the same port, completed her loaded trial, when a mean speed of 13½ knots was obtained on the measured mile at Aberledy. The machinery, during the day worked with great smoothness. The vessel afterwards left for Rotterdam, and has made the fast passage of 30 hours from Leith to the Hook of Holland.

Nordfarer.—On March 16th the steamship *Nordfarer*, built by Palmer's Shipbuilding & Iron Co., Limited, Jarrow, to the order of the Norden Steamship Co., of Copenhagen, was taken to sea for her official steam trials. Her dimensions are as follows:—Length between perpendiculars, 365 ft.; breadth, 48 ft. 6 in.; depth, moulded, 31 ft. 6 in. The vessel is of the spar deck type, having a full poop, bridge, and topgallant forecastle. The engines, constructed by the Palmer Co., are of the triple-expansion type, with cylinders 25 in., 41 in., and 66 in. by 45-in. stroke, steam being supplied by two single-ended boilers, working at a pressure of 100 lbs. per square inch. During the trial the engines worked in a highly satisfactory manner, and a mean speed of 11¾ knots was attained on the measured mile.

Kildalton.—On March 16th the steamship *Kildalton*, recently launched by Messrs. J. M'Arthur & Co., Paisley, and engined by Messrs. Shanks, Anderson & Co., Pollokshaws, went down the river on her trial trip. The trip was in every respect satisfactory, a speed of about 9 knots being attained. The *Kildalton* has been built to the order of the Glasgow Steam Coasters' Co., Limited.

Chatham.—On March 16th this vessel, recently built by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of the Britain Steamship Co., Limited, London, made her official trial trip in the Tees Bay, which proved to be very satisfactory, the engines working smoothly and the vessel herself behaving in a very satisfactory manner. The steamer is fitted with the builder's patent trunk, has full poop, bridge, t g f., &c., and carries a d.w. cargo of about 3,200 tons. She is also fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited, of Stockton.

Tremont.—On March 21st the screw steamer *Tremont*, which has been built by the Tyne Iron Shipbuilding Co., Limited, Willington Quay, to the order of Mr. E. C. Thin, Liverpool, left the Tyne on her official trial trip. The steamer is of the following dimensions:—Length, 350 ft.; breadth, 47 ft.; and 28 ft. 3 in. moulded depth. The engines, which have cylinders 25½ in., 41 in., and 68 in., by 48 in. stroke, with three large single-ended boilers, have been built by the North-Eastern Marine Engineering Co., Limited, Wallsend, and during the trial the machinery worked with perfect smoothness. The vessel attained a speed of 12 knots on the measured mile.

Edenhall.—On March 21st the steamship *Edenhall*, built by Irvine's Shipbuilding & Dry Docks Co., Limited, West Hartlepool, to the order of Messrs. J. E. Guthe & Co., of the same town, proceeded to sea on her trial trip. Her dimensions are as follows:—318 ft. by 44 ft. by 23 ft. ½ in.; with poop, bridge and topgallant forecastle, cellular double bottom for water ballast, all fore and aft, and in after peak. Special regard has been paid for dealing with rapid loading and discharging of cargoes, for which extra large hatchways have been fitted with powerful winches of the company's own make and double derricks to each hatch, together with all the latest improvements in the entire outfit of the vessel. The boats are placed on a platform deck overhead and forming an awning for the protection of the crew in topical climates. The engines, which have been built by Messrs. Wm. Allan & Co., Limited, Sunderland, are of the triple-expansion type, with cylinders 22 in. 36½ in. and 61 in., stroke 42 in.; steam being supplied by two single-ended boilers, working at a pressure of 160 lbs. per square inch. During the trial a mean speed of 11 knots was obtained, and Mr. Craig, who represented the owners, expressed himself highly satisfied with the smooth working of the engines and general equipment of the vessel. The builders were represented by Mr. Purdon, manager, and the engine builders by Mr. Harrison, manager. The vessel proceeded to Blyth under the command of Captain Haun to load for her maiden voyage.

Tannenfels.—On March 23rd the steamer *Tannenfels*, which has been built by Messrs. Wigham Richardson & Co. for the Deutsche Dampfschiffahrts Gesellschaft "Hansa," of Bremen, went for a trial trip, and then sailed for Middlesbrough to load. The *Tannenfels* is 432 ft. in length by 54 ft. beam, and is fitted with quadruple-expansion engines balanced on the Yarrow, Schlick, and Tweedy system, working at 210 lbs. pressure, and fitted with Howden's forced draught. This is the fifth set of engines of this type built by Messrs. Wigham Richardson & Co. for these owners, and the former ones have been so successful that the "Hansa" Co. have ordered others of the same type. The owners were represented on the trial trip by Mr. Wulff, and the steamer sailed under the command of Captain Allerholt.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

UTILIZATION OF WASTE HEAT.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—You have kindly promised, I notice, in this March issue of your MARINE ENGINEER, to insert, in Correspondence columns, letters bearing on utilisation of waste heat, fuel economy, and such like matter. It is said at this present date that 9-10ths of the heat stored up in coal is lost, you wish correspondence as to means in utilising this waste heat. Some 40 years ago, in the time of square boilers, 10 lbs. of steam, jet condensation, and 5 lbs. of coal per I.H.P. per hour, 9-10ths of the heat was then said to be lost, surface condensation, then the cylindrical boiler followed, with higher pressure of steam and less fuel consumption, and so on to the compound, triple, quadruple, and now the five-crank engines of Mr. Mudd, which is declared, in print, to be only at a cost of less than 1¼ lbs. per I.H.P. per hour. Whether this economy in fuel consumption is due to the five-crank system alone, or in combination with feed heaters, improved cylinder steam jacketing, other engine-room adjuncts, and Ellis & Eaves' induced draught, is left to the initiated to understand. I have spoken to several engineers who have been shipmates with Ellis & Eaves' induced draught, they distinctly say there is a decided economy in fuel and an equal and regular steam pressure throughout the voyage, even with indifferent coal. Other engineers I have spoken with have distinctly stated in the same terms (fuel economy, equal steam, &c.) of Howden's forced draught. Now, with both the forced and induced draught above mentioned, both systems utilise the waste heat, reducing the funnel temperature about one-third by a tubulous arrangement above the boiler in heating the air previous to entering the furnaces. The total air for combustion is delivered at a mean temperature of about 180 deg., and may be termed heated air draught, forced or induced.

The question now arises whether during the last 40 years any of the 9-10th waste heat loss has disappeared and to what approximate amount? At what does it now stand, and can it be reduced to a marked degree by any other to be adopted systems, and how? At the first introduction of hot air blast of 600 deg. temperature some sixty years ago in iron smelting, about 74 per cent. economy in fuel ensued, at a cost of less than 5 per cent. of fuel to heat the blast by outside means from about 60 deg. to the 600 deg. The 5 per cent. cost applied as hot air blast effected a saving of 74 per cent. A great and sudden stride indeed. The temperature point of combustion and to support combustion is at about 1000 deg. Fah., and before combustion can ensue and be sustained, the air for combustion must be raised at the seat of combustion to the combustion point temperature. A 20-ton consumption would require 13,440,000, about 13½ million cubic feet of air, weighing about 450 tons for furnace combustion; this large volume of air would have to be raised from, say, 60 deg. to 1,000 deg. temperature to support combustion and then lost up the funnel at double volume by expansion, 27 million cubic feet at, say, 700 deg. temperature; prodigious refrigeration at the seat of combustion, prodigious loss up the funnel. Molesworth says it requires ·0027 lbs. of coal to raise 1,000 cubic feet of air 1 deg. in temperature, and this prodigious refrigeration at the seat of combustion (at furnace) costs 14 tons out of the 20 tons consumption—just 70 per cent.

This prodigious refrigerating influence at the seat of combustion could be greatly decreased by a complete hot air blast of 600 deg. forced or induced draught to the furnaces. By an improved system of tubulous arrangement at the base of funnel, a 400 deg. temperature of the air to feed the furnaces might be obtained from the waste heat, and further increase of 200 deg., making 600 deg. by a tubulous arrangement, taking a 3 per cent. portion of heat from the fruits of combustion (not waste heat) after combustion has taken place, and this 600 deg. complete hot air blast (no cold air mixture) applied direct to the seat of combustions. (See the cost previously mentioned for air heating for smelting purposes, also the percentage saved in fuel). Both land and marine boilers might be so treated; and, as to hot air jacketing engine cylinders up to 600 deg., I see no difficulty, existing cylinders might be so treated. But the question arises, who will experimentalize in a proper and complete manner? Capitalists require some settled return for their cash, shipowners in the present hard times require something above an experiment in a ship. There are many gentlemen of means with a mechanical turn of mind, especially amongst steam yacht owners, who would take pleasure in the like, but the difficulty is to get in touch with them. The experiment seems costly, but nothing near so costly as it seems. A second-hand steam trawler, boiler and engines, in fair condition (one furnace boiler), easily obtainable on the fishing coast, a shore experiment tried, and not a costly proceeding, good results might be obtained, also a fixed knowledge and data, and pave the way for a profitable return. I think I have spoken sufficiently on the subject for a first letter, and this, I hope, will give rise to other letters. Thanking you,

Yours faithfully,
T. W. BAILEY.

Newport, Mon.
March, 1898.

CONSUMPTION OF COAL ON H.M.S. "POWERFUL."

To the Editor of THE MARINE ENGINEER.

SIR,—Mr. Goschen stated in the House of Commons, on the 7th inst., that the *Powerful* had consumed 8,300 tons of coal on her voyage from Portsmouth to Hong Kong.

It was understood that with the exception of a short run at full speed, the ship was to proceed to her destination at 12 knots per hour.

Taking the distance at 13,000 miles, and allowing the enormous amount of 650 tons for cooking, lighting, and auxiliary purposes, the boilers must have consumed no less than 12 cwt. of coal per mile, or 172 tons per 24 hours, to enable the engines to propel the ship at 12 knots!

It is evidently doubtful whether even this speed was obtained for the 7 tons of coal burnt per hour!

The ship is no floating gun carriage, she is a mere armed cruiser 500 feet long, hull, engines, and boilers built in accordance with the most advanced Admiralty ideas for obtaining a high rate of speed at sea.

Where would our shipbuilding be if our builders produced on their responsibility such a result for their customers?

I am Sir,
Yours truly,
A CONSTANT READER.

Belmullet.
March 13th, 1898.

Reviews.

The Standard Electrical Dictionary. By T. O'Conor Stone. 2nd edition. London: Crosby Lockwood & Co. 1898.

THIS useful work has now reached a second edition. Its general plan is too well-known by electricians and manufacturers for it to be necessary for us to go into it very deeply. Briefly, it may be said that it is something more than a mere dictionary. For it goes beyond the simple statement of the meaning of the terms employed in electrical work (which is all a dictionary proper would give) and gives us some little dissertation on the relation of the thing discussed to the science in general, and on its functions generally.

The note under the head of Electricity itself is perhaps characteristic of the thoroughness of the work. The definition of what electricity is, too, is one of the most difficult problems set before the author of such a work. For no one has the faintest idea of what it is, even though its powers and some of its sources are now so well known and gauged, and in so many ways harnessed to the chariot of science. The definitions of previous writers (including those of no less than four lexicographers) are set out. Some of these are no definitions at all. Take for example that which says—"Electricity is the name given to the supposed agent producing the described condition (*i.e.* electrification)of bodies." A so-called definition which involves the use of the word under discussion is no definition at all. For it refers us back to what we want to know, end lands us in a never-ending wandering over a vicious circle. Garrot's definition is really perhaps the best. But the frank admissions of the author of this volume, and of Mr. Sydney F. Walker, and of the editor of Weale's Dictionary of Terms (also quoted) are perhaps the boldest confessions of the ignorance of our science on that point. Others have tried to avoid the admission by pouring out a cloud of more or less unmeaning work.

Space is economised by the avoidance of all repetitions. The explanation of an important term is followed by a note of all its synonyms. Sometimes a short discussion, coupled with a reference to the explanation elsewhere afforded of an analogous term, which is not quite a synonymous one, effectually disposes of an important point. Thus it is that, though the dictionary is itself arranged on the usual alphabetical plan, an index becomes useful, and is here afforded. The additional matter rendered necessary by the advance of science since the publication of the first edition, is contained in an appendix of some fifty pages, and this is elucidated by plentiful and clear illustrations and diagrams, as in the body of the work. It too has its index, and here we would make the only suggestion for improvement. One can quite see that the addition by appendix was convenient to the author, and immaterial to the reader so long as an index was appended. But as the matter now stands, there is some slight extra trouble involved by the necessity of, in some cases, consulting two indices We would suggest, therefore, that the new matter should be incorporated in the index to the general body of the work. This however, is a trifling and mechanical matter. We can safely, commend the book to our readers, and assure them that they will appreciate the clearness of definition and judgment in selection which the author throughout the work evinces.

Drawings of Types of Steamers.

MESSRS. THOS REED & CO., of Sunderland, have issued a very useful work in these two large sheets of drawings with index. The recent developments in the way of new types of ships have evidently suggested the undertaking. A longitudinal section of a modern five-deck passenger steamer, together with a transverse section of the same vessel, enables the authors, with the help of reference numbers to the index, to shew the whole arrangements of this class of vessel. The names and appearance of the various parts of the hull are shewn. So, too, are the machinery arrangements, the cargo-working and rope-handling appliances, and the various provisions made for the carriage of ship's and consumable stores, and for the ventilation and lighting of the ship. Then, also, are shewn the usual position of the refrigerating plant and of the accommodation for the various classes of passengers, and of the ship's officers and crew. The vessel so treated is of the type which is classed under Lloyd's three-deck rule. Other sections follow, shewing the construction of spar-deck and well-deck vessels, and of the modern class of vessel constructed with web frames. The same treatment is applied to the patent types of ship which have sprung from the ingenious devices of N.E. coast shipbuilders to combine the maximum of carrying capacity with the minimum register tonnage, and at the same time to give the shipowner a cheaply built and safely worked ship. Amongst these types appear Messrs. Doxford's patent "turret deck" steamer. Here the ingenious joggle plating, which forms so important a part of the design is very clearly shewn. Messrs. Ropner's patent "trunk deck" steamer is similarly illustrated, as is the "trunk" steamer of Messrs. Hok & Laing's patent. The whole seems a very useful and complete guide to the names and details of the modern type of ship, and it will doubtless be very useful to our readers We may mention that the work is obtainable in two forms at different prices. The more expensive costs ten shillings, and the drawings in this form appear on cloth and on rollers. The less expensive form is on paper, folded in a case. This costs but six shillings. We might suggest, however, that an intermediate style of production might suit many persons who do not want to hang the drawings on walls, and who yet wish to refer to them so frequently as to run great risk of tearing the cheaper edition by constant folding and unfolding. Might it not be advisable to have some of the folded drawings issued on untearable linen backs?

The New Zealand Shipping Co., Limited, have contracted with a firm of Clyde shipbuilders for a large steel screw steamer of 430 ft. in length. This vessel will be built to the classification of the British Corporation for the Survey and Registry of Shipping.

Miscellaneous.

The Watt Anniversary Lecture.—The Watt Anniversary Lecture, which had been postponed on this occasion, owing to the illness of the lecturer, was delivered in the Watt Institution Greenock, on the 11th ult., by Dr. Thrope, Director of the Government Laboratory, London. His subject was "Watt, and the Discovery of the Composition of Water," a discovery, the lecturer said, as momentous to science as the greatest of Watt's inventions was for social and economic progress. Proceeding to describe the essential facts which led to the discovery of the true chemical nature of water, Dr. Thrope defined the relative share which Watt, Cavendish, and Lavoisier had in it. So far as they could prove from documentary evidence, Watt, although reasoning from imperfect, and indeed altogether erroneous data, was the first to state distinctly that water is not an element, but is composed, weight for weight, of two other substances, one of which he regarded as phlogiston and the other as dephlogisticated air. It would be a mistake, however, for them to suppose that Watt thought precisely the same doctrine of the true nature of water that they did at present. Nor did Cavendish utter a more certain sound. What they regarded at present as the expression of the truth they owed to Lavoisier, who stated it with a directness that ultimately swept away all doubt and hesitation, except perhaps in the mind of Priestley, whose random experiment gave the first glimmer of the truth. Each of the men he had named, however, played an independent but equally important part in the establishment of the greatest scientific truth the century has brought to light.

Private Steam Yachts as Naval Reserve Ships.—The problem as to whether steam yachts, having all the properties recognised as indispensable in such craft—*e.g.*, fineness of form and luxuriance of living accommodation—can be built to answer other more general, and—in given circumstances—more vital purposes than the pleasurable conveyance of their owners over placid seas, has at various times received some attention. Several very large vessels, for example, have been built and equipped as much with a view to their being requisitioned in time of war, as for the use of their owners in luxurious voyaging during "the piping times of peace." Structural strength over what would naturally have been required, and features answering to the purposes of both offence and defence, have been present in not a few of such vessels. Another feature, not altogether essential to the character of a pleasure yacht, has been great coal-carrying capacity, and at the present time this matter is receiving noteworthy practical attention in the case of vessels building and to be built. In this connection it is noteworthy that not one of all the palatial and speedy steam yachts, so many of which have been built within recent years, can cross the Atlantic at anything like full speed, under their own steam, without in some way re-coaling. This problem of the coal-endurance necessary to cross the Atlantic at as near top speed as possible throughout the voyage, is being tackled by Mr. G. L. Watson, the well-known designer, of Glasgow, in the magnificent vessel he is at present planning for Mr. Gordon Bennett, of the *New York Herald*. The record in this matter is at present held by the *Varuna*, designed by Mr. Watson for Mr. Eugene Higgins, of New York, which vessel succeeded in accomplishing the voyage at an average speed of 12½ knots—very much below the maximum of which she was capable. The length of Mr. Bennett's vessel is to be 310 ft., and she is to have engines of the quadruple-expansion four-crank type, capable of developing 7,000 I.H.P. The bunker capacity will be such that the paramount condition of steaming from the Old World to the New at 17 knots speed without re-coaling will be fulfilled. A steam yacht intended to demonstrate the same problem has been placed in a United States yard by Colonel Oliver H. Payne, author of the Act for the "protection" of American shipbuilding as regard foreign-built yachts. This vessel is to be 300 ft. long, 35 ft. beam, and to steam 15 knots on an average, with enormous coal bunker capacity. A striking instance of the importance now being attached to coal endurance is also found in the fact that the new steam yacht, *Princess Alice*, of 1,270 tons, launched in November last by Messrs. Laird Bros., of Birkenhead, for H.R.H. the Prince of Monaco, has, since her launch, been cut asunder, and had 16 ft. of extra body worked into her, amidships, the sole reason, it is believed, being to augment her coal bunker capacity.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from February 11th to March 9th, 1898.

3402 S. Loewenberg. Boats.
3406 T. Tschernoff. Manufacture of iron and steel.
3411 R. de Tiedemann and R. Buerstinghaus. Preventing vessels from sinking.
3432 J. Legge. Manufacture of iron and steel tubes.
3435 A. Nixon. Steam boiler furnaces.
3461 W. Bell. Water-tight fittings for skylight.
3465 W. D. Grimshaw. Steam boiler furnaces.
3468 H. Maxim. Motive power for propelling boats.
3470 G. H. Wise and C. E. Ward. Trawl nets.
3502 R. J. Rae. Ships' propellers.
3511 J. Wilkinson and P. Israel. Marine engine.
3541 A. McLaine. Steamship propeller shafts.
3550 J. C. Robinson. Locks for ships' cabin doors.
3573 C. S. Snell. Laying submarine cables.
3589 C. Mackintosh. Collision mats for vessels.
3603 E. G. Camelinat. Joints for metallic vessels.
3623 I. and W. Smith. Sounding horn for steamers.
3666 H. Buecking. Screw anchor plates.
3676 N. Chandler. Steam engines.
3681 F. Swanzy, W. Cleaver and J. Thame. Buoyancy apparatus.
3693 J. E. L. Ogden. Valves.
3728 W. G. Heys. (J. J. Heilmann, France.) Propulsion of ships.
3734 J. Broadfoot. Ventilators for ships.
3736 J. Thom. Water-tube steam generators.
3757 J. H. Kirk. Gangways for steamboats.
3769 J. Chary and H. J. Friederichs. Vessels.
3777 W. W. J. Toussaint. Steam boilers.
3778 F. Ljungstrom. Steam generators and condensers.
3784 B. S. Weston. Production of induced draught.
3824 J. I. and J. E. Thornycroft. Steam traps.
3832 W. Arnott. Motive power engine valve gear.
3847 G. H. Sheffield and J. D. Twinberrow. Boiler stays.
3852 H. M. Steele and J. R. Bird. Boiler feed apparatus.
3855 R. Haighton, Ltd., and A. Haighton. Boilers.
3857 W. T. Lord. Boat paddles.
3988 A. E. Muirhead. Packing.
4006 W. Mayo. Oars.
4052 J. Aitken. Iron and steel ship riveters.
4061 W. G. Smith. Water-tube steam generators.
4085 H. Orley. Revolving sails.
4107 J. B. Furneaux. Water tube steam boilers.
4112 C. L. Eastlake. Obtaining power from waves.
4115 W. T. Sugg and J. W. Lofts. Ventilating cowls.
4154 J. W. Boanson. Locking of nuts.
4167 H. Smith and J. Dickson. Boiler furnaces.
4170 T. Jenkinson. Metallic packings.
4180 J. L. Boothman and W. Hastie. Manœuvring gear.
4181 W. J. Hewitt and A. E. Dearden. Utilizing tidal energy.
4216 A. Forster. Regulating the supply of feed-water.
4225 C. A. de Lambert. Propulsion of navigable vessels.
4230 E. Lehrner. Safety apparatus for steam boilers, &c.
4261 C. A. R. Mansfeldt. Metallic packing.
4307 G. H. Jones. Naval and military warfare apparatus.
4311 B. Rider. Wave power utilising apparatus,
4317 F. J. Shewring. Trolley connection for boats.
4333 H. Watson. Piston and packing rings, &c.
4337 C. Koerte. Friction clutches.
4342 A. Hanemann (Thomsen, Uruguay). Composition as a non-conductor of heat.
4349 E. Brown. Ship signals.
4395 M. H. C. and R. E. C. Shann. Propelling vessels.
4419 J. R. Bell. Grab dredgers.
4453 E. A. Goddin. Lock nuts.
4457 H. Froedlich. Safety devices for water gauges.
4466 W. Geipel and F. M. T. Lange. Boilers.
4484 J. G. A. Kitchen. Pistons.
4609 S. C. Davidson. Centrifugal fans and pumps.
4630 E. H. O. R. Ropner, Jun. Cargo vessels.
4647 W. Powell and M. J. Oliver. Nut locks.
4687 J. V. Pugh and W. H. Nelson. Steering locks.

4691 F. Toovey. Propeller shafting for vessels.
4710 H. J. Harding. Apparatus for steering vessels.
4719 H. Drinkmann. Reversing screw steamers.
4767 J. W. Melling. Valves for steam engines.
4783 A. W. Stewart. Cooling apparatus for ships.
4785 J. Whittaker. Adjustable frame for boilers.
4800 R. Forster. Valve gear for engines.
4823 C. Hass. Bearings for shafts.
4896 R. P. Thorpe. Ships' propellers.
4897 O. Imray (W. A. McCool, United States). Metallic tubes.
4906 J. Gjers. High-pressure steam for engines.
4930 T. H. Anstey. Sheet slip for sailing boats.
4947 R. Baird. Steam boiler furnaces.
5012 F. Glenfield. Preventing boiler corrosion.
5013 L. J. Todd. Construction of steam boilers.
5022 P. F. Oddie. Duplex direct-acting pump.
5025 C. L. Burdick. Gauge.
5074 E. Lodetti. Injectors for steam boilers.
5080 C. Williams. Ships' bottom preservatives.
5103 H. Cruse. Generating steam.
5113 W. Penman. Boilers.
5128 J. Kay. Trawlers.
5151 M. H. C. Shann. Valve gear.
5166 H. J. Fraser. Boilers.
5249 C. A. Allison (J. C. Parker, United States). Boilers.
5250 C. A. Allison (J. C. Parker, United States). Steam engines.
5325 La Société Anonyme Du Temple and H. Brillié. Boilers.
5330 W. and A. R. Crawford. Closing water-tight doors.
5338 D. Adorján. Steam boilers.
5336 T. Dillon. Lowering and raising boats.
5369 E. Box. Floating docks.
5373 J. F. Dell. Anti-fouling compositions.
5383 R. C. Westphalen. Vessel propeller.
5394 W. Buffington. Lock-nut.
5397 C. A. Haufton. Lock-nut.
5412 A. E. Smith. Boilers.
5457 E. Williams. Pumps.
5462 T. Makepeace and A. S. Fowles. Screw propellers.
5476 J. H. Toulmin, T. Coulthard, jun., and W. Norris. Water-tube boiler.
5507 J. B. Pegden. Raising sunken ships.
5591 H. A. Royce and W. Beardmore. Armour plates.
5598 C. Reich. Feed-water pipe arrangement.
5604 J. O'Neil. Gland-cocks for steam engines.
5613 F. W. Lanchester. Shafts for screw propellers.
5634 W. B. Johnson. (J. Pierpont, United States). Boilers.
5642 A. E. Muirhead. Packing.
5695 F. von Kodolitsch. Riveting machines.
5696 J. T. Mallinson. Valve gear for steam engines.
5710 J. W. Jones. Sound-recording instruments.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C, Second Class.

February 26th, 1898.

Agar, James A.	2C	London
Armour, W. E.	1C	S'nd'land
Brennan, A. E.	1C	,,
Cartwright, A.	2C	N.Shields
Christie, J. M'G.	1C	London
Clare, Walter ..	2C	Liverpool
Clark, J. G. D.	2C	S'h'm'ton
Croll, Jno.	1C	London
Cutler, Jno. E.	2C	S'h'm'ton
Dick, David L.	2C	N.Shields
Douglass, James	2C	,,
Dunn, Jno.	2C	Aberdeen
Dunn, Thos. E.	2C	S'nd'land
Earnshaw, Wm.	1C	London
Ellis, Jno. W.	2C	,,
Elwood, A. J. ..	2C	Liverpool
Gibb, Alfred C.	1C	Aberdeen
Halder, J. A. ..	2C	N.Shields
Heggie, Jno. ..	1C	Liverpool
Hirons, Wm. ..	1C	London
Hurd[illegible]s, [illegible]fred	1C	N.Shields
Jenkin, F. R. E.	1C	Hull
Jobson, Jos. G.	1C	London
Joyner, A. L. ..	2C	N.Shields
Kirkbride, T. B.	1C	,,
Looney, E. B...	2C	,,
Macnab, James	1C	London
Ross, Andrew P.	2C	Liverpool
Scotland, Ernest	2C	London
Selbie, Alex. ..	1C	Aberdeen
Thomson, Hugh	1C	N.Shields
Tullock, J. E. ..	2C	Aberdeen
Wilkinson, Sam.	2C	Hull

March 5th, 1898.

Abraham, T. T.	1C	Cardiff
Beecher, Hy. T.	2C	,,
Bennett, Chas.	2C	Glasgow
Black, J. M'A.	1C	,,
Bos, Wm.	2C	,,
Carnie, Jno. ..	2C	London
Constant, W. J.	1C	,,
Cuninghame, J.	1C	Glasgow
Davies, T. W...	2C	Cardiff
Dewar, Wm. S.	1C	Cardiff
Dickie, Wm. F.	1C	Glasgow
Duncan, H.	2C	Liverpool
Ellis, Richd. M.	1C	N.Shields
Evans, Trevor..	2C	Liverpool
Gilbertson, Jno.	2C	N.Shields
Green, Geo. Hy.	2C	Cardiff
Holt, Wm. W...	1C	,,
Jones, Geo. H. B.	2C	Liverpool
Kirk, James M.	2C	Glasgow
Kneller, Geo. ..	2C	London
Lowrie, Alfred	1C	N.Shields
Macpherson, D.	1C	Glasgow
Mathieson, Jno.	2C	,,
Medd, Frank ..	2C	N.Shields
M'Lay, J........	1C	London
M'Naught, S. ..	2C	,,
M'Pherson, G.	1C	Cardiff
Muir, Robt......	1C	Glasgow
Niven, Jno. S. S.	1C	,,
Parry, Charles	2C	Liverpool
Prowse, Robt. ..	1C	N.Shields
Randall, Adolph	1C	S'h'm'ton
Rolls, Albert E.	1C	,,
Rosser, Richd...	2C	Cardiff
Saville, George	1C	Liverpool
Sayers, Wilfred	1C	London
Semple, Samuel	1C	Glasgow
Sim, Jno........	2C	,,
Smeaton, Wm.	1C	,,
Stump, Wm. L.	2C	London
Thomas, Evan	2C	Liverpool
Thomas, Thom.	1C	Cardiff
Turnbull, Jas.	1C	Liverpool
Walker, Wm...	1C	London
Williams, Hy...	2C	Cardiff
Winterbottom, C	2C	Liverpool

March 12th, 1898.

Adam, Thomas	1C	Liverpool
Barrow, Jno. W.	1C	London
Bell, R. L.	2C	Leith
Bone, James ..	2C	Greenock
Capey, Thos. H.	1C	Liverpool
Charlton, F. S..	2C	,,
Finlay, Dalziel	2C	,,
Gale, Wm. Jno.	1C	,,
Gilbert, Thos. B.	1C	N. Shields
Gillespie, Thos.	2C	Leith
Govan, John ..	2C	Greenock
Hill, Murray, J.	2C	London
Izett, George ..	1C	Leith
Johnston, Chas.	2C	,,
King, Jno. P. ..	2C	Hull
Leng, Thos. S.	2C	,,
MacKenzie, P...	1C	Leith
McBain, H. A.	2C	Greenock
McWhinnie, J.	2C	Liverpool
Morton, Wm. ..	1C	Leith
Muir, Andrew..	1C	Greenock
Reid, T.	2C	N.Shields
Rodger, J. M. ..	2C	Greenock
Rowe, William	1C	Liverpool
Smith, A. B. ..	1C	N.Shields
Snowball, T. ..	2C	,,
Sproull, Wm. ..	2C	,,
Steele, E. S. ..	1C	Greenock
Thomson, Alex.	2C	Liverpool
Thomson, H. ..	2C	London
Wakelin, H. P.	2C	,,
Whale, Wm. R.	2C	Leith

March 19th, 1898.

Atkinson, J. W.	2C	Cardiff
Balfour, David	1C	Glasgow
Beekel, A. M...	1C	Cardiff
Browell, Jno. G.	2C	W.H'pool
Buckley, Daniel	2C	Cork
Cannon, P. C...	1C	London
Careless, L. J...	1C	,,
Carey, James E.	2C	W.H'pool
Chisholm, K. ..	1C	Glasgow
Coates, Jno. A.	1C	W.H'pool
Collins, Wm. ..	2C	N.Shields
Copland, Jno...	1C	Glasgow
Davison, R. W. D	2C	W.H'pool
De Snoo, Henry	2C	Liverpool
Dick, Alexander	2C	Glasgow
Freeland, W. B.	2C	,,
Gordon, David	2C	Dundee
Graham Harold	1C	Liverpool
Greenwood, J. T.	1C	N.Shields
Hunter, W......	1C	Glasgow
Johnson, C. P.	1C	London
Knowler, G. W.	1C	Cardiff
Law, Archibald	2C	Glasgow
Lee, R. A. E. B.	2C	Hull
Leyshon, A. H.	1C	Cardiff
Mackinnon, D.	2C	Glasgow
Manson, G. P.	2C	W.H'pool
Menard, A. L...	2C	Dundee
Moise, John ..	2C	Hull
Morrison, J. J.	2C	Glasgow
Nicol, Charles..	2C	,,
Nicolson, G. B.	2C	,,
Nucator, J. B.	1C	Dundee
Ross, Wm. S. ..	1C	,,
Rutherford, J. L.	1C	N.Shields
Slater, A. J......	2C	Cardiff
Slater, James..	1C	S'h'm'ton
Stewart, James	2C	Glasgow
Turnbull, G. D.	1C	N.Shields
Tyson, Wm. ..	2C	Liverpool
Venables, Thos.	1C	Cardiff
Wallace, Thos.	1C	Glasgow
Walsh, Peter ..	1C	W.H'pool
Wasser, H.	2C	London
Williams, W. C.	2C	Cardiff
Wyndham, J. N.	1C	,,
Young, J. W. H.	1C	N.Shields

The "Engineer's Gazette Annual."—This useful little annual, which is compiled by Mr. A. R. Leask, has now reached its tenth year, and has grown at each succeeding issue till at the present it contains 256 pages. It contains this year interesting articles on modern engineering subjects, tide tables for London, and constants for 368 ports, tables of areas, knots, pressures, temperatures, etc., electrical and general engineering notes, rules, recipes, formulæ, tables and statistics, the distances and time on all ocean mail routes, reference notes on steam boilers, list of ships of the Royal Navy and their stations, list of engineers and ships in the Royal Naval Reserve, information relating to the Department of Postal Telegraph, the Marine Department of the Board of Trade, Lloyd's Register, Ordnance factories, and boiler insurance companies. In addition to which there is a goodly collection of reference notes for engineers, and lastly, but not least, a miscellany of entertaining extracts. On the whole, it is a very handy and useful compilation.

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EN FOUNDATIONS.

The Marine Engineer.

LONDON, MAY 1, 1898.

THE session of the Institution of Naval Architects, which has just taken place, was signalised as usual by a series of valuable papers contributed by all the leading lights in naval architecture and marine engineering. The ground covered by the papers and their contents are so voluminous in their character that the space at our disposal will only permit us to glance briefly at each of them. Captain A. Kriloff, professor at the Naval Academy of St. Petersburg, was a contributor of two valuable papers, in which he continues the theory of the oscillations of a ship on waves as originally outlined by the late Mr. W. Froude, and, further, in his second paper deduces the results from such oscillation in stresses developed in the hull. As a simple exposition of his mathematical investigations as to such oscillations, consisting of pitching and rolling combined, the formulæ for which occupy a bulky appendix, he shows the results of his investigations under various conditions in the form of very graphic curves, which were characterized as very valuable by Professor Biles as exemplifying results to the ordinary staff of a drawing office, who might not be able to follow all his mathematical calculations. In his following paper of the stresses resulting from such oscillations he decomposes the stresses into their elementary parts. The variable stresses added to the stresses of equilibrium he divides under three heads: (1) stresses arising from change of support, parts of the ship immersed in and others emerged out of water; (2) The additional stress arising from the difference of the wave and the hydrostatic pressures (Smith's correction); and (3) the stresses arising from the heaving and pitching motions of the ship. Mr. Archibald Denny and Sir William White considered the paper a valuable addition to such literature in a form that practical men could deal with.

A PAPER that more particularly will interest our readers is a very bold suggestion by Mr. Leopold Roper, as to the direct attachment of copper sheathing plates to hulls of vessels, in which that gentleman puts forward a well-thought-out plan of copper sheathing which, if successful and permanent, should entirely cut out the present expensive and still unsatisfactory method of combined wood and copper sheathing as applied to iron or steel vessels, since Mr. Roper estimates that his method need not cost more than half that of the present method. He lays down 10 desiderata for an ideal sheathing which briefly are: cheapness, prevention of fouling, complete provision against galvanic action between elements of the system and copper-plating and hull; snugness of sheathing to hull; whilst retaining ordinary thickness of copper, the weight generally to be minimum; fewness of parts and easy inspection and repair; no space left for water to lodge; no material capable of splintering or becoming saturated; confinement of local injury; and the system to be unaffected by torsional strains in severe weather. No one will dispute for a moment that these would be ideal qualities for a sheathing if unaccompanied by other drawbacks. Mr. Roper claims to have secured them. His system consists of first coating the surface to be sheathed with an insulating material applied as a paint, then a layer of waterproofed felt, and, finally, a system of open brass grids coated with the insulating paint, the spaces in the grids being filled flush with hard packing pieces also coated with insulating material. The copper plates are riveted to these grids, each overlapping those adjacent at two ends, and the whole grid and plate is fixed to the hull by screws with counter-sunk flush heads, the screws also being coated with the insulating material preventing metallic contact between copper plates and hull. The reduction of thickness in this compound sheathing as compared with wood and copper is considerable, being only ⅝ of an inch as compared with about four inches, and the system would appear to fulfil the desiderata as before defined. Although Mr. Roper has no practical experience in the sheathing to submit, everything must have a beginning, and we were sorry to note that so much discouragement in discussion was offered to the inventor, not by specific criticisms of the details of his proposed system, but merely on the possible unforeseen dangers of an unknown system. We think well of it.

IN reference to the war now taking place between America and Spain, the account of Captain William H. Jaques, late of the United States Navy, of submarine torpedo-boats, as experimented upon by Mr. John P. Holland, and later by the Holland Co. for the United States Navy Department, is of much interest. Mr. Holland has been experimenting since 1877 upon various successive models to the number of four, and his experience is now embodied in two examples—the *Plunger* and the *Holland*, the former of which was built by the Holland Co. for the United States Navy Department, and the latter has been built by the company, embodying the essential elements of Mr. Holland's type, for experiment by the company. The *Plunger* is 84 ft. long, of circular section, 11 ft. 6 in. in diameter, surface displacement of 149 tons, and submerged displacement of 165 tons.

She is provided with a water-tube boiler of the Mosher type, heated by oil fuel, with main vertical triple-expansion steam engines of 600 H.P., giving a speed of 15 knots on the surface, or 14 knots awash. When submerged she is driven by an electro motor of 70 H.P. operated from accumulators, the motor being convertible into a generator when not required as a motor, for re-charging the accumulators. Her principle of submergence, as in all the boats of the Holland type, is by driving, though direct down-haul screws have been added, though not considered by Mr. Holland to be a requisite of the system. The *Plunger* has two openings in the nose piece for the discharge of service torpedoes. In addition to hand gear for horizontal steering and driving, there are automatic devices for maintaining submergence at predetermined depths. In the *Holland* no attempt has been made to secure a higher speed than suffices for proper driving and steering properties. It is fitted, therefore, only with a 50 H.P. gasoline engine for surface runs, and a 50 H.P. electric motor for submerged work. It is only, therefore, 50 ft. in length, 11 ft. in diameter, 138 tons displacement, with superstructure awash, and 139 tons when submerged. She is fitted with one 18 in. service torpedo tube and two dynamite guns fitted for powder and compressed-air discharge. Such craft for harbour defence can be quickly and cheaply constructed, and would be much more dangerous than the ordinary torpedo-boat, as they are quite efficiently protected against quick-firing guns which would riddle a torpedo-boat if visible.

The subject of the resistance to motion of solids in a fluid, which has already had much attention from members of the Institution of Naval Architects, was continued in a paper contributed by Mr. B. Schieldrop, of Bergen, who suggested that the stream line theory, and the wave line theory based upon it, are not perfect when actual conditions, rather than hypothetical conditions, are considered. The essence of the communication was a description of some elaborate submerged models to be towed under water and fitted with electrical and paper record apparatus of the velocities of the forces acting upon such models. As a consequence of the use of these models it is suggested by the author that the task of ascertaining the magnitude and character of these dynamic forces, to which the skin of a solid passing through water is subjected, is a possible one, and that the results so ascertained would show disturbing stresses not accounted for by the theories of stream lines as at present accepted.

A paper upon the trunk-deck steamer *Oscar II.*, by Mr. W. Hök, attracted much attention and gave rise to some interesting comments by Mr. Martell, Mr. Ropner, Sir Raylton Dixon, Mr. Robert Thompson, and others, as the type for bulk cargo carrying has proved, according to Mr. Martell, a very successful one. Mr. Hök pointed out the mechanical principles as a stiffened girder, that were involved in the use of a trunk deck extending the whole length of the vessel in place of a bridge erection extending at least one-half of the vessel's length to obtain classification in Lloyd's. Mr. Hök considers that the trunk sides, with their continuation of pillars to the top of the tank, give trunk-deck vessels practically four vertical members instead of two, enabling these vessels to resist racking and twisting strains in a two-fold degree. Mr. Martell indirectly confirmed the value of proper pillaring by instancing from his experience the serious consequences ensuing from an absence of a proper number of pillars in order to make open space between decks. Mr. Hök reports that the action of the trunk deck in a heavy sea is most valuable in protecting the vulnerable parts. A sea coming over the side of an ordinary vessel sweeps the deck obliquely, carrying with it everything not sufficiently secured. In a trunk-deck steamer the sea strikes the trunk at an angle, diverges along the unobstructive main deck, strikes the slanting bridge front and disappears through the bulwark openings into the sea without ever reaching the trunk deck and the vulnerable parts. Mr. Hök claims a series of twelve advantages for trunk-deck vessels, including safety in a heavy sea, trimming by the stern in all cases, great protection to the bottom, against both upward and downward excessive strains, and small register tonnage as compared with deadweight and measurement capacity.

Mr. R. E. Froude gives the Institution the benefit of his experiments in the reversal of twin-screw propellers so as to turn inwards when going aheadinstead of outwards, as is most usual. As a result he states that the efficiency difference is so slight as to be almost unimportant, but, curiously enough, such difference as there may be is in the favour of inward turning rather than the contrary. This conclusion was traversed as not being always the case in every build of ship, by a communication from Mr. John Duncan, who gave a case where his experience had been to the contrary. Mr. Watkins also stated that in the case of a tug her turning diameter was much lessened when the twin screws were set to run outwards as when they were set to run inwards for going ahead. Sir William White, however, confirmed Mr. Froude's general conclusion so far as their experience had gone at the Admiralty, and suggested that there were some other reasons than the mere direction of the turning of the screws that affected the results in Mr. Duncan's case.

THE *Yashima* seems to be an exceptional ship as regards steering qualities, so much so that she has been honoured by a special paper upon these qualities, read by Philip Watts, Esq., who was referred to by Admiral Colomb as the father of the method of accurately measuring the turning powers of ships, and that the turning powers of the *Yashima* were an extraordinary development of these methods. This method essentially is the removal of the after deadwood to the rear of the pivoting point. Mr. Watts gained experience by the conduct of trials with H.M.S. *Thunderer*, and as a logical deduction from the observations then made, practically the whole of the after deadwood of the *Yashima* was removed, and a very large balanced rudder was fitted, the propeller shafts being allowed to run bare. She was also given a very fine run low down and a V bow, the bilges being very flat. The bilge keels were also placed well forward to favour turning. As a result the pivoting point, when the rudder was hard over, proved to be almost exactly at the stem of the vessel. The length over all of the *Yashima* is 412 ft., and the tactical diameter was 720 ft. The curve, however, traced by the centre of gravity of the vessel lies outside this course. One remarkable feature in the steering of the *Yashima* was the absence of tendency to yard when the helm was amidships; at the same time she was very sensitive to small angles of helm. With 5 per cent. of helm the circle turned in was about the same size as that turned in by the *Thunderer*, with less length over all and with the helm hard over. Sir Edward Reed was of opinion that there ought to be more complete development of steering trials with cut-away deadwood.

MR. CHAS. H. HASWELL, who was chief engineer of the United States Navy when her Majesty came to the throne, contributed, through the Secretary a most interesting communication as to his unequalled reminiscences of early marine steam engine construction and steam navigation in the United States of America. His reminiscences commenced in 1822 with vertical crosshead engines connected with sliding clutches directly to the paddle-wheel shafts, and also geared to a shaft with a fly-wheel at each end. In boiler construction, too, his recollection goes back to the punching of boiler plates manually by the aid of a long wooden lever, on which four men operated, and the location of the punching was guided entirely by the eye. In 1824, the compound, or Woolf engine, was introduced with overhead beam. In 1828-29, a rivalship had sprung up in a steamboat service between Albany and New York. Up to 1836, the fuel was wholly of pine wood, after which anthracite was tried. The first propeller steamboat was introduced in 1837. John Ericsson began to introduce his engines and propellers in 1842, and the surface condenser was introduced by him in 1846. In 1848, the steamers of the Collins Line, between New York and Liverpool, were constructed, and the *Atlantic* in 1850 made the then record passage of ten days and fifteen hours. No consumption of fuel per H.P. in those early days is on record, but it is computed that in 1840 it was about 5 lbs. per H.P.

AN amusing and courageous paper by Mr. A. G. Ramage, upon how best to evade the Tonnage Act so as to produce the minimum net register, occasioned some humorous criticism as to the unblushing immorality of openly defining the best modes of evasion of net measurement under the Act before so worshipful a meeting; but no doubt the information is of value to shipowners who may desire lowest net measurement for dues on largest gross tonnage. Where the charter may be on net tonnage the evasive devices may cut the other way. For cargoes in bulk other than deadweight, the expansion of engine space as a deduction may be unprofitable. The author clearly defines the basis upon which deductions may be made under the Act, and the best mode of utilizing such deducted spaces, whilst still retaining their availability for deduction. The manner of effecting these variations in design to affect a minimum net register is clearly explained by reference to comparative diagrams, to which for details we must refer our readers. The exemption of a top-gallant forecastle, or a bridge-house, poop, or deck-house by leaving out the doors thereto is pointed out, and an ingenious device to afford protection in place of such missing doors.

IN the loading and discharging of grain cargoes, Mr. Frederic E. Duckham made comparison between the slow and leisurely methods of 40 years ago, and the present expeditious mode of dealing with grain cargoes of forty times the amount by special machinery, without which a debit of £70 a day for each day in dock would soon destroy any profit on present rates of freight. The special machinery described by Mr. Duckham were two types of pneumatic elevators now in successful operation. One of these is employed for the discharge of sea-going vessels overside into barges, as at the Millwall Docks, the Albert Docks, Bremerhaven, Hamburg, and other places. The machinery is afloat in a hull, and the grain is drawn with a current of air from the hold of the ship to an elevated vacuum tank or receiver. The grain then discharges itself by gravitation through an air-lock to a weighing machine, and after weighing it flows in the barge in bulk, or may be sacked if desired. The grain can be sucked easily and without loss from every corner of the hold, and is improved by its contact with the conveying air. The other type is that as used at Limerick, in which the grain, after being elevated by suction as before, is subjected in a closed chamber to a pressure of 6 to 8 lbs. per square inch of air, which pressure thus forces the discharge of the grain through a pipe with convenient outlets into desired bins in a warehouse, or may be equivalently used to discharge grain into ocean-going ships from barges or other supply.

MR. JAMES HAMILTON contributes a paper, of which the greatest merit is that it is a record of actual facts relative to H.P. absorbed by skin friction and wave-making in ships of different forms and proportions, deduced from progressive trials investigated by him during years of work. Mr. Hamilton also does not merely give bare results of trials, but has endeavoured, and apparently very successfully, to formulate and proportion the relative effects of various builds or forms upon I.H.P. required for various speeds, and has justified such empirical deductions by actual tests observed. To make his methods clear he gives formulæ and figures, by way of example, of a series of vessels which have all been designed to a uniform length of 270 ft., and from that he carries the application of his empirical formulæ to a series of absolute ships of very various lengths, breadths, and displacements, and shows a series of curves for each, giving I.H.P. for any speed in knots up to nearly 19 knots. The valuable information in the paper was much appreciated by Mr. R. E. Froude, Mr. A. Denny, and Sir William H. White and Professor Biles—Sir William White, however, taking exception to the assumed standard loss for load engine friction, which he considered under-estimated, the delivery of power to the propeller, in his opinion, not averaging more than 80 to 85 per cent. Professor Biles also stated that an increase of breadth in relation to length did not in itself necessarily increase the resistance. There were cases on record where the opposite had been the case.

As a contrast to the above practical paper, of which the theory was deduced from and based upon actual results, Professor Hele-Shaw contributed a paper on the same class of subject, in which he investigates the nature of surface resistance of water and of streamlike motion under certain experimental conditions of an artificial enclosed stream with sudden enlargements and contractions, as investigations upon the resistance of containing surfaces, and, conversely, of interposed bodies of various contours immersed in such streams, for the investigation of the resistance and disturbance produced by such disturbing bodies. Much trouble has been taken by the Professor in introducing air or gas bubbles into the experimental stream or colouring matter, so as to render their distortion and their molecular condition visible by photography in a manner suitable for reproduction, which he first showed to the Institution at their International Congress, and by request has continued his investigations for the benefit of the present meeting. Much valuable discussion followed this paper, Sir William White stating that there was no doubt that the question of frictional resistance demanded more knowledge about the relative movement of the water in contact with or very near to the boundary of a solid body, and related a personal incident in which, on one of Mr. Thornycroft's torpedo-boats, he had a personal demonstration by actual test that there was at least some portion of water close to the hull of a fast-moving boat which did not travel much relatively to the skin of the boat.

ON quite a different class of subject was the paper sent by Herr von Kodolitsch, upon riveting by electricity, as one of the new phases of electrical operation now receiving great attention from shipbuilding yards or bridge-making establishments. The author believes that he has now perfected an electric riveting machine capable of superseding both hydraulic and pneumatic riveting. If a central generating station and a system of transmitting wires is already a part, or intended to be a part, of any establishment, the addition of electric riveters will be less expensive than laying down a hydraulic or pneumatic system. As regards quantity of work, an electric machine is stated to do 1,200 rivets a day of ten hours with three men and a boy. The electric riveting machine can be moved about at will in any required position, and the pressure of the die for various sized rivets is easily regulated in the machine by an electro-magnetic clutch, so that only the necessary amount of work is done to suit the size of rivet. Unfortunately, the absence of the author prevented him from giving further particulars, which were called for by several members, and which would, no doubt, have been interesting to our readers.

INSTITUTION OF NAVAL ARCHITECTS.

THE spring meeting of the Institution of Naval Architects took place on March 30th, 31st, and April 1st, in the hall of the Society of Arts, John Street, Adelphi, under the presidency of the Right Hon. the Earl of Hopetoun, G.C.M.G., and there was a large attendance.

The President opened the proceedings by calling upon the secretary, Mr. George Holmes, to read the annual report of the Council. The secretary then read as follows :—

The Council reports, with much pleasure, that the past year has been one of great activity, during which the Institution has made satisfactory progress. Its finances, as shown by the annexed statement of receipts and expenditure, are in a sound condition. During the year, 151 new members and associates were elected; while the losses, due to death and resignation, amounted to 25, leaving a net increase of 126.

It was announced in the last annual report that the Council had arranged to celebrate the sixtieth year of the reign of Her Majesty the Queen, by holding an International Congress of Naval Architects and Marine Engineers in London. The Council have now to report that the congress was held under most favourable circumstances in the month of July last. The Governments and Navies of almost all the maritime States in the world were represented, and the Institution had further the satisfaction of welcoming to this country the committees who had received us with such unbounded hospitality and kindness in Paris, Hamburg, and Berlin: also representatives from the Society of Naval Architects and Marine Engineers of the United States; from the Société des Ingenieurs Civils de France; the Association Technique Maritime; the German Institution of Civil Engineers, and a number of our foreign members and associates.

His Royal Highness the Prince of Wales, who had graciously consented to become Honorary President of the Congress, opened the proceedings at the Imperial Institute, on Tuesday, July 6. Their Royal Highnesses the Duke of Saxe-Coburg and the Duke of York most kindly accepted invitations to become Honorary Vice-Presidents, as also did the Right Hon. George J. Goschen, M.P., First Lord of the Admiralty, and the Right Hon. C. T. Ritchie, M.P., President of the Board of Trade.

A large and representative Reception Committee was formed, composed principally of members of the Institution, but which also included the late Lord Mayor of London, Alderman Sir George Faudel-Phillips, Bart, G.C.I.E., the Hon. Lord Provost Richmond of Glasgow, and many other gentlemen not connected with the Institution, who rendered invaluable services in the reception and entertainment of the guests, and to whom the best thanks of the Institution are due.

Her Majesty the Queen conferred the highest distinction on the Congress by graciously receiving the members at Windsor Castle on Saturday, July 10th.

The papers read at the meetings, and a record of the excursions and entertainments, together with other particulars relating to the organisation and work of the congress, are published in a separate volume of the Transactions, which has been already distributed.

This volume contains also the expression of the grateful thanks of the Council to all those who assisted it in the work of the Congress and the reception of the guests. Without this assistance, which was freely and generously given, the congress could not have been brought to a satisfactory conclusion.

The Council have received from the foreign representatives at the congress many letters and illuminated addresses couched in the warmest terms, which they thankfully acknowledge. These communications have also been published in the special volume of the Transactions, and will be preserved amongst the most valued archives of the Institution. As a memorial of their visit to Great Britain the representatives from Hamburg and Bremen have most kindly presented a handsome piece of plate to the Institution, which has been gratefully accepted as a mark of the esteem and goodwill of the donors.

The Council have, after full consideration, determined not to hold a summer meeting during the current year.

The Council have had great pleasure in awarding a premium to Mr. Sydney Barnaby, for his paper "On the Formation of Cavities in Water by Screw Propellers at High Speeds;" and a similar premium to Mr. Alexander Ramage for his two papers, "A Mechanical Method of ascertaining the Statical Stability of Ships," and, "On the Use of the Mean Water-line in designing the Lines of Ships."

The vacancy in the representation of the Institution on the committee appointed to assist the Marine Department of the Board of Trade, caused by the death of Mr. Alfred Blechynden, which was reported last year, has been filled by the election of Mr. John Sampson, of Messrs. Maudslay, Sons & Field, who has kindly consented to act.

The Council announce, with much regret, the death of Admiral Popoff, who was an honorary member of the Institution; and of Mr. Richard Barnwell, late managing director of the Fairfield Shipbuilding and Engineering Co., Limited.

The President (the Right Hon. the EARL OF HOPETOUN, G.C.M.G.) then delivered his opening address :—It has been my good fortune since I had the honour to become President of this Institution to be able to congratulate the Council and the Members upon the satisfactory nature of our annual reports. I do not think that the report just presented falls short in any respect of the high level reached by its predecessors; indeed, in my judgment it surpasses them all. It is, in some respects, a superlative report: it is short and concise, but it contains paragraphs which have reference to some of the most important events which have happened to us since our inception as a corporate body. Our monetary position is a sound one, and the number of members on our rolls is steadily increasing year by year.

I do not think that we are likely to forget the events of last July. To some of us, on whom the pressure of responsibility for the complete success of the great Congress rested, the contemplation of a satisfactory retrospect may not be the least enjoyable part of the proceedings. But we feel that such a pleasing retrospect would be impossible, had we not received the loyal co-operation and the unstinted support of all the members of our body, and we, as officers of the Institution and members of the Council, cannot feel sufficiently grateful for that support and co-operation.

The Institution will always entertain feelings of the deepest and most respectful gratitude towards Her Majesty the Queen for her gracious kindness towards us, and for the countenance and encouragement which she extended to our work.

Neither can we forget that His Royal Highness the Prince of Wales was pleased, in the midst of his many engagements at that most busy season, to honour us with his patronage and presence. To their Royal Highnesses the Duke of Saxe-Coburg-Gotha and the Duke of York we are also deeply indebted for the interest which they took in our proceedings.

From the First Lord of the Admiralty, and last, not least from Lord Salisbury, as Secretary of State for Foreign Affairs, we received help and support so priceless that it is not possible to express within the limits permitted to me to-day the obligation which we feel towards them for the kindness bestowed upon us.

Since these matters are freely dealt with in the special volume of our Transactions to which the report alludes, I will only now call your attention to the many expressions of gratitude, and to the many marks of goodwill which have been conveyed to us by our guests of last summer.

There is nothing, so far as I can learn, of a startling nature in the Admiralty programme of the present year. Six new battleships are about to be laid down. Three of these are to be of the *Formidable*, or improved *Majestic* type; the designs of the remainder have not, I understand, as yet been decided upon.

Two years ago, when the designs of the *Canopus* type of battleship were made public, there was a chorus of rejoicing on the part of the advocates of moderate dimensions. We were told that to build these ships 2,000 tons smaller than the *Majestic* was a step in the right direction, that they were less expensive, and offered a smaller mark to torpedoes than the larger ships. I ventured to point out in my address, at the time, that this reduction in displacement could not be obtained without sacrificing some portion of one, or all, of the qualities which we speak of as the desiderata in a ship of war—armament, propelling power, radius of action, and defensive armour.

In the *Canopus* class it was decided to reduce the thickness of the side armour considerably as compared with the *Majestic*. Our naval authorities had doubtless excellent reasons for following this policy at the time, and it is not necessary for us to particularise, or even surmise, what those reasons were: but personally I am thankful that we are returning to the heavier type of vessel, for in my judgment the increase in cost and displacement is more than compensated for by the enormous advantage which they obtain in defensive power. While on the subject of side armour it may be interesting to note that the Admiralty have taken a new departure in another class of vessel. For a good many years no cruisers with vertical side armour have been added to the British Navy. Last July it was announced that four such vessels were to be commenced. Some surprise was occasioned by this apparent deviation from our settled policy; but policy, as I need hardly remind you, is often dictated by physical considerations, and, till the recent improvements in armour were effected, it would not have been possible to put plates on the sides of swift cruisers of sufficient strength to adequately preserve them from the effects of shell fire. At the present moment this is no longer the case, and we need therefore feel no surprise at the Admiralty having decided to order the construction of these ships, which will have great speed, very considerable armament, and vertical protection to their vitals sufficient to resist any attack which they might be reasonably expected to encounter. I cannot leave this portion of my address without expressing the regret which will, I am sure, be fully shared by all present, that the completion of the Admiralty programme of 1897-98 has been so grievously retarded by the deplorable labour troubles, which for seven months disorganised all engineering business in this country, and which were only terminated in January of this year.

In the Mercantile Marine, also, the year has not been marked by any striking departure in naval architecture. There are frequent rumours of new types and developments, but nothing has yet been reduced to practical shape.

The output of the shipbuilding yards of the United Kingdom amounted, according to Lloyd's register, to about 952,000 tons gross (924,000 steam; 28,000 sail). In addition, warships to the extent of 95,000 tons displacement were launched, inclusive of those constructed at both dockyards and private establishments.

The mercantile output of the year in the United Kingdom was less than that of 1896 by 207,000 tons, but was about equal to that of 1895. The decrease was mainly in steam tonnage. The construction of sailing vessels which has been rapidly falling off since 1892, reached, last year, a lower point than any of which there is previous record. In 1892 sailing tonnage formed 24 per cent. of the output; while last year it formed only 3 per cent. of a considerably smaller total.

The warship tonnage launched at dockyards and private establishments in 1897, likewise showed a very considerable decrease (68,000 tons) from the figures of the previous year. The tonnage launched for the British Navy was less by 51,000 tons than was the case in 1896.

About 25 per cent. of the mercantile output was built to the order of foreign and colonial shipowners in 1897, as compared with 30 per cent. in 1896, and 20 per cent. in 1895. Japan provided the largest amount of work for British shipbuilders, over 6 per cent. of the total output having been built for that country. Germany followed with over 3 per cent.

Of the warship output, 30 per cent. was for foreign account, Japan and Chili showing the largest totals.

I have already alluded to the effect of the great labour dispute on the realisation of the Admiralty programme; it has had a no less marked influence on the output for the Mercantile Marine. With the close of that unhappy struggle it is encouraging to find the shipbuilding and engineering industries with every prospect of full employment for some time to come. The returns show that the amount of tonnage (1,013,000 tons) now in hand in the United Kingdom is very large; and, as the quantity of sailing tonnage is unprecedentedly small, engineers as well as shipbuilders may be congratulated upon the present condition of affairs. It is generally understood, moreover, that the outlook as regards fresh orders is bright. Altogether, we may safely anticipate that, for both employers and employed, the immediate future will provide some reparation for the unfortunate losses of recent months.

It is noticeable that the honour of producing the largest vessels of the year's output does not fall to this country but to Germany, our great rival in the shipbuilding industry. In that country were launched during 1897, the following three steamers, of more than 12,000 tons each, viz.:—

Kaiser Wilhelm der Grosse	14,349 tons gross.
Kaiser Friedrich (approximate)	12,500 ,, ,,
Pretoria (approximate)	12,500 ,, ,,

while the largest vessel launched in the United Kingdom was the *Cymric*, of 12 340 tons.

The credit for the construction of the largest sailing vessels of the year belongs, not to the United Kingdom, but to the United States of America and to France. In the United States have been built seven sailing barges ranging from 3,180 to 3,800 tons, for trade on the Great Lakes; while the returns from France, where the shipbuilder and shipowner are alike stimulated by the operation of the bounty laws, show three sailing vessels of upwards of 3,000 tons each. In the United Kingdom no sailing vessel over 2,500 tons was built. It may be noted that the recent spurt in the construction of large sailing vessels in France appears to have partially spent itself. At the end of last year, less than 10,000 tons were in hand, as compared with 37,000 tons twelve months earlier.

It is striking to observe, from the statistics recently issued, how small an increase has taken place in the merchant navy of the United Kingdom during 1897.

During recent years we have been accustomed to large additions to its tonnage. After allowing for losses, sales to foreigners, &c., the net increase of the merchant navy of the United Kingdom, during the first nine years of the past decade, amounted, on the average, to 366,000 tons per annum. In comparison with these great totals it is remarkable to find that, during 1897, the net increase only reached the insignificant amount of 8,600 tons.

This great falling off is partly due, no doubt, to the strike, but it is also largely attributable to the great amount of tonnage which has been transferred to foreign and colonial owners during the year.

If we take the first half of the decade we find that, on the average 189,000 tons were then annually transferred from the United Kingdom; and if we take the second half of the decade we find the annual average stands at 344,000 tons. In 1897 even this latter average has been greatly exceeded, the enormous total of 446,000 tons having been sold abroad during the year. It will be understood that these figures are exclusive of new vessels built in this country to the order of foreign and colonial owners.

The foregoing figures indicate that it is now becoming customary for an amount of tonnage, equal to that of almost any other merchant navy, to be removed within, say, every two or three years, from the register of the United Kingdom on account of foreign sale. This tonnage, bought probably at moderate prices, and involving no large capital expenditure on the part of the purchasers, all tends to increase the severity of the competition with which the British shipowner has to contend.

This is a matter of grave importance. It is a sign of the times which should not escape the notice of those who are responsible for legislation. Whatever explanation might be afforded by an intimate knowledge of each separate transfer, it appears to be scarcely doubtful that the foreigner is often able to secure an adequate profit from vessels which his British competitor does not find sufficiently remunerative.

From a national point of view, however, there is one consolatory aspect of this subject. In the main, the vessels which are sold abroad are found, upon investigation, to be of not very recent construction. For instance, nearly three-fourths of the vessels transferred from the United Kingdom during the last two years were built before 1885. This fact, taken in conjunction with the largely increased amount of steam tonnage which is now annually broken up, suggests that the British shipowner is generally alive to the necessity of keeping his fleet abreast of the times.

This view is supported by the circumstances that the gross addition of newly-built steamers to the Register of the United Kingdom during the last decade has exceeded 7,300,000 ton. These figures represent nearly three-fourths of the steam tonnage at present owned in the country. Some allowances must, no doubt, be made on account of losses and sales to foreigners among these recently built vessels; but, after making all needful deductions we can congratulate ourselves that the greater part of the vast British Mercantile Marine is of efficient modern construction.

I now turn to the subject of the papers to be read at the meetings, and can congratulate you on the fulness of the programme and on the interesting character of the subjects which you will have the opportunity of discussing. One of the most striking features of the programme is the number of papers communicated to us by our friends from abroad. No less than seven out of a total of seventeen have their origin outside this country. I think the Institution is to be heartily felicitated on this fact, proving, as it does, that we are able to enlist the sympathy and co-operation of naval architects in all parts of the world. The United States, Germany, Austria, Russia, and Norway, each contribute to our instruction on this occasion.

What more convincing proof could we have of the excellent results to the profession which have attended our policy of visiting our foreign friends in their own countries, and of inviting them to honour us by their presence here.

I thank you, gentlemen, for the indulgence with which you have heard me to-day, and I will now conclude by formally moving the adoption of the report.

We publish in this number the paper and discussion on the "Trials of the *Diadem*" by Sir John Durston, K.C.B., in our last we gave the paper by A. F. Yarrow, Esq., vice-president, on "Description of some Experiments with a Water-tube Boiler," and in our Editorial Notes we refer to the rest of the papers read.

RECENT TRIALS OF THE CRUISER "DIADEM."[*]

By SIR JOHN DURSTON, K.C.B., R.N., Engineer-in-Chief to H.M. Navy, Vice-President.

THE author had the honour, in April last, to submit to the Institution some notes on the trials of the cruisers *Powerful* and *Terrible*, the first ships in our Navy of large power fitted with water-tube boilers of the Belleville or large tube type, and the present paper respecting the trials of the cruiser *Diadem* is submitted as a supplement or a continuation of those notes.

While the boilers of the first four vessels of the *Diadem* class were under construction, trials at Paris of Belleville boilers fitted with economisers showed considerable advantages over the *Powerful* type of boiler, in economy of fuel, less tendency to production of smoke, and lower funnel temperatures. Consequently it was decided to alter the boilers of the vessels of this class by reducing the number of generator tubes, and fitting economisers as shown in Figs. 1 and 2, which gives longitudinal sections of the boilers of *Powerful* and *Diadem*, and also a transverse view showing two boilers of the last-named ship, one being shown in section and the other in elevation.

Comparing the section of the boilers of *Diadem* with that of the *Powerful* type of boiler, it will be seen that the number of rows 4½ in. generating tubes in each element has been reduced from ten to seven, while over the generating tubes there is a space provided corresponding to that of the combustion chamber in an ordinary return tube cylindrical boiler, and above this space is situated another nest of tubes of smaller (2¾ in.) diameter, and seven rows in height, forming the economiser. The furnace air-blowing engines supply jets of air to this space as well as into the furnaces below. The feed water is pumped into the lower part of the economiser, traverses to the top of its elements, and from thence it is led to the steam collector for feeding the generating tubes.

The advantages of this arrangement are that the combustion is more effectually completed, the escaping funnel gases are of a much lower temperature, firing does not require so much attention, and a considerable economy in fuel is obtained.

The Table following shows the disposition of heating surfaces and the total weights in representative eight-element boilers in *Powerful* and *Diadem* respectively.

It will be observed that there is a slight increase in weight of water due to the economiser, but this does not interfere with the tactical advantage possessed by the boiler in raising steam quickly, for the amount of water in the generator portion is reduced.

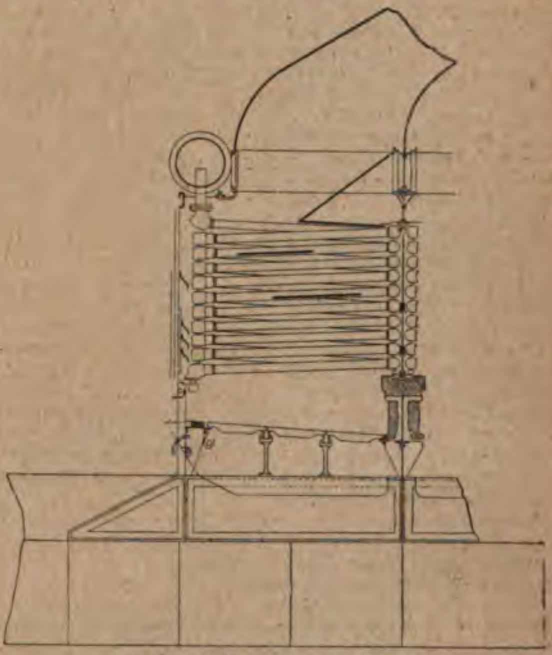
The machinery of the *Diadem* class is designed to attain a maximum power of 16,500 I H P., and a continuous sea-going power of 12,500 I.H.P. for as long as the coal lasts.

The specified trials were :—

(1) An eight hours' trial at 16,500 I.H.P. with all boilers in use;

(2) A thirty hours' trial at 12,500 I.H.P. with all boilers in use; and

(3) A thirty hours' trial at 3,300 I.H.P. with the number of boilers at discretion of contractor. (Only the after set of eight boilers, or 27 per cent. of the total boiler capacity, was actually used.)



H.M.S. "POWERFUL."—FIG. 1.

The maximum pressure at which the engines were specified to work was 250 lbs. per square inch, with a boiler pressure of 300 lbs., an increase of 40 lbs. beyond that specified for the *Powerful* and *Terrible*.

The engines are of a similar type to those of the *Powerful* and *Terrible*, two low-pressure cylinders being fitted, *i.e.*, the engines are of the four-cylinder triple-expansion type.

The diameters of the cylinders are as follow :—

High-pressure	.. .. ..	34 inches.
Intermediate-pressure	.. ..	55 ,,
Two low-pressure	.. .. each	64 ,,

The stroke is 4 ft., with a design cut off in the high-pressure cylinder of 73 per cent.

ONE BOILER.

Ship.	Number of Elements.		Heating Surface.			Fire Grate.	Weight of Boiler, with Furnace Fittings, Casings, Lagging and Mountings complete.	Weight of Water.	Total Weight.
	Generator.	Economiser.	Generator.	Economiser.	Total.				
			Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.	Tons.	Tons.	Tons.
Powerful ..	8	Nil.	1,420	—	1,420	49	17·4	1·1	18·5
Diadem ..	8	6	995	355	1,350	49	16·7	1·3	18

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[*] Read at the Thirty-ninth Session of the Institution of Naval Architects Wednesday, March 30th, 1898. The Right Hon. the Earl of Hopetoun, G.C.M.G., in the Chair.

The ratio of low-pressure to high-pressure cylinder volume is 7·08.

Allowing for a clearance in the high-pressure cylinder of 25 per cent., and in the low-pressure cylinder of 15 per cent., the designed real ratio of expansion at full power was about 8·3.

The cylinders are arranged as in the *Powerful*, with the high-pressure cylinder forward, and the two low-pressure cylinders aft. The two low-pressure cranks are opposite each other, and the high-pressure and intermediate-pressure cranks also opposite each other, but at right angles to the low-pressure cranks.

The high-pressure and intermediate-pressure cylinders are arranged with centres as close together as possible, the valve casings of each of these two cylinders being for this purpose placed away from the other cylinder. The two low-pressure cylinders are similarly arranged, the moments of the forces therefore causing vibration are relatively small.

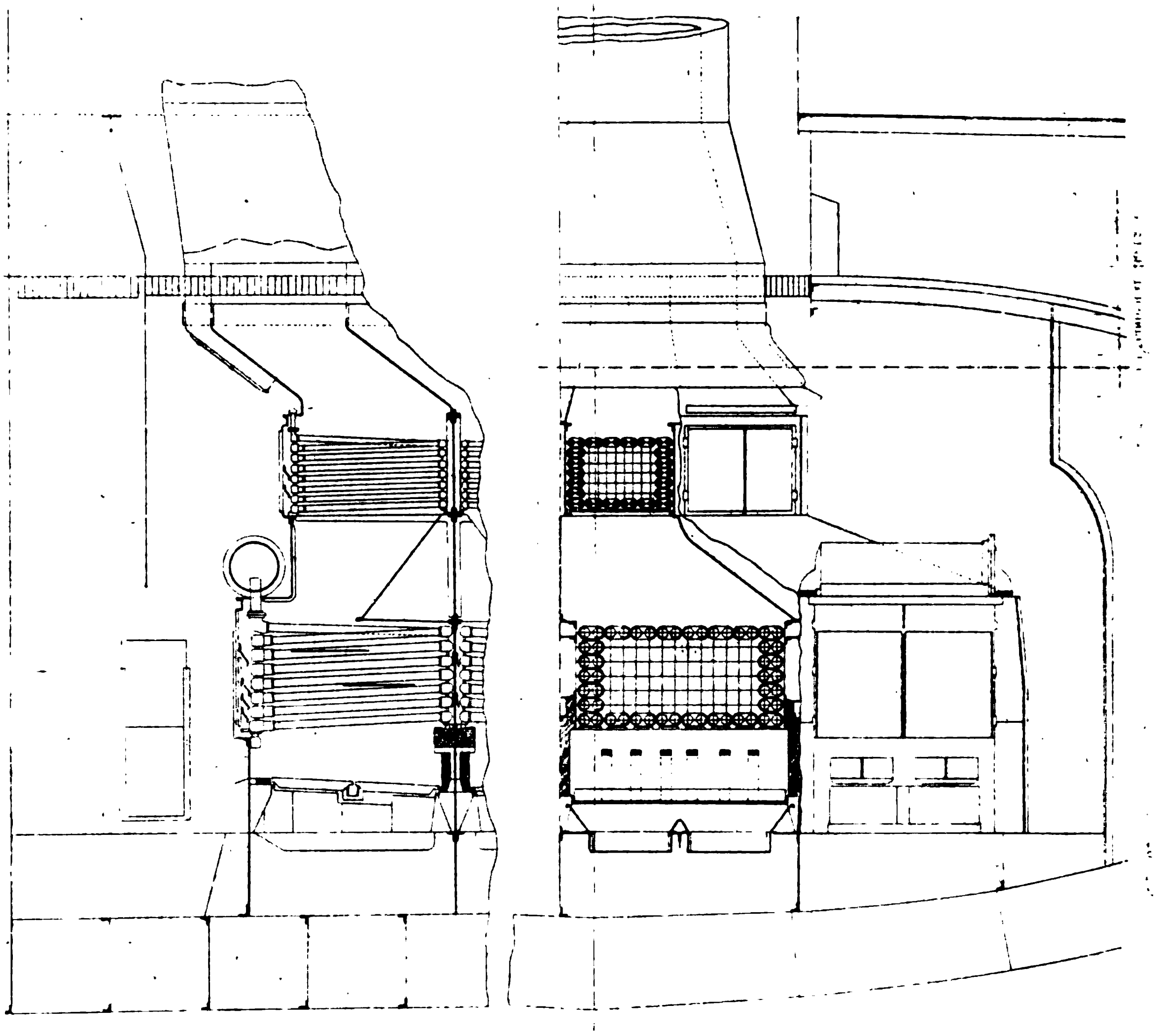
It may be stated that, throughout the whole range of power and revolutions developed in these trials, the vibration was inappreciable.

There are no balance weights nor any special means of reducing vibration beyond the arrangement of cranks and disposition of cylinders.

All the cylinders are steam jacketed, those of the intermediate-pressure and low-pressure cylinders only were used on the trials, the pressure maintained in these jackets being regulated to approximately equal their respective receiver pressures.

The boilers are thirty in number, twenty of them containing eight generator elements and six economiser elements, six having seven generator elements and six economiser elements, and the remaining four containing nine generator elements and seven economiser elements; this distribution being dependent upon the width of stokeholds available in the various sections of the ship.

The boilers are arranged in four compartments with tubes fore and aft, eight in each of the three after and six in the forward one, placed back to back in each compartment. The gases are led into four funnels, and the uptake leads from the boilers are practically vertical.



H.M.S. "Diadem."—Fig. 2.

Each boiler compartment has a separate main steam pipe and feed system, the four main steam pipes being carried to the forward bulkhead of engine-room, with the usual stop-valve to each pipe at the bulkhead.

The total heating surface of the boilers as originally designed was 42,270 square feet, or 2·56 square feet per I.H.P. After the boilers were modified the heating surface in the generator portion was reduced to 29,600 square feet, or 1·8 square feet per I.H.P.; while in the economisers an addition was made of 10,950 square feet, or ·66 square feet per I.H.P., making a total surface of 40,550 square feet, or 2·46 square feet per maximum specified I.H.P.

There are four main feed pumps and four auxiliary feed pumps; but, unlike the *Powerful* and *Terrible*, the main feed pumps and

TABLE A

MEAN RESULTS OF THE TRIALS OF H.M.S. "DIADEM," AND TWO VESSELS WITH CYLINDRICAL BOILERS.

Name of Ship	Description of Trial	Proportion of Full Designed Power Developed	No. of Boilers in use on the Trial	Grate Area in Use	Heating Surface in Use	Steam Pressure (by Gauge)		Fall of Pressure from H.P. Receiver to Steam Line of H.P. Diagrams		Jacket Pressures (by Gauge)			Receiver Pressures (by Gauge)			Mean Effective Pressures in the Cylinders				Mean Cut Off in the H.P. Cylinder	Vacuum in Condensers	Revolutions of Main Engines per Minute	I.H.P. (Total)	Mean Effective Pressure referred to the L.P. Cylinder	Absolute Pressure at Release in the L.P. Cylinder	Total Ratio of Expansion on Trial	Coal used per hour		Propellers				Speed on Measured Mile or Deep Sea Course	Date of Trial
						Boilers	Engines	At Commencement of Stroke	At Middle of Steam Admission Line	H.P.	I.P.	L.P.	H.P.	I.P.	L.P.	H.P.	I.P.	L.P. Forward	L.P. Aft								Per sq. ft. of Grate	Per I.H.P.	Diameter	Pitch	Slip Per Cent.	Expanded Blade Area of Each		
				sq. ft.	sq. ft.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		ins. of mercury			lbs.	lbs.		lbs.	lbs.	ft. ins.	ft. ins.		sq. ft.	knots	
Diadem	Contractors' 30 hours' coal consumption	·201	8	392	10,820	265	202	5	21	123	57	11·5	170	54	9·2	31·02	10·44	7·15	7·87	·37	27·4	67·24	3,318	15·8	6·4	15·7	18·4	2·18	16 0	22 11½	16·4	79	12·74 (a)	18th & 19th January
Do.	Contractors' 30 hours' coal consumption	·776	30	1,462	40,550	280	245	3	22	0	98	25	241	97	20	79·0	28·07	16·4	16·46	·54	26·7	107·67	12,813	36	19	10·3	13·9	1·59	..	..	20·5	..	19·79 (b)	21st & 22nd January
Do.	Contractors' 8 hours' full power	1·046	30	1,462	40,550	291	249	1	20	0	117	35	245	117	36	88·87	32·56	21·09	21·44	·68	26·7	119·1	17,202	46·5	16	8·7	20·8	1·76	..	..	23·3 22·8	..	20·6 (c) 20·72 (e)	26th January
Do.	4 hours' trial	·961	24	1,140	31,720	291	239	1	26	0	115	30	235	113	22	84·18	32·76	19·0	19·31	·62	26·7	116·3	15,861	43·7	15·8	8·7	27·1	1·93	..	..	..	..	Not taken.	29th January
Do.	15 hours' trial	·198	8	392	10,820	275	244	2	27	0	71	15	176	61	11·2	30·81	10·71	7·57	8·02	·37	26·5	64·7	3,266	16·2	6·9	15·7	19·6	2·35(d)	..	..	..	..	Not taken	7th February
Do.	15 hours' trial	·431	10	784	21,640	257	156	4	23	0	66	13·5	151	58	12	53·84	20·0	10·22	10·56	·54	26·1	89·5	7,119	25·5	8·5	10·3	17·6	1·94(d)	..	..	..	..	Not taken	8th February
Do.	30 hours' trial	·78	24	1,140	31,720	265	240	5	21	0	107	30	237	102	24	79·15	30·56	15·43	18·06	·54	26	107·6	12,852	38·4	12	10·3	21·2	1·88(d)	..	..	..	..	Not taken	10th & 11th February
Recent representative battleship	30 hours' coal consumption	·518	8	820	25,045	139	136	18	40	133	40	10·1	136	37	5·6	32·43	19·00	9·68		·555	27·7	82·91	6,216	23·8	8	–	13·6	1·82						
Do.	8 hours' natural draught	·872	8	820	25,045	150	148	5	20	133	17	7·7	140	56	11·1	48·24	25·07	19·13		·638	25·6	97·16	10,465	34·3	11·7		29·5	2·3						
Do.	4 hours' full power	1·023	8	820	25,045	152	147	6	23	146	49	13·1	147	59	13·6	54·14	28·04	14·69		·707	26·4	101·6	12,280	38·4	14·0		Not taken							
Recent representative 2nd-class cruiser	30 hours' coal consumption	·513	8	626	18,700	145	149	3	21	Not used	38	8·5	141	46	6·5	39·35	18·55	8·9		·39	26·0	117·85	4,925	24·7	7·9		12·6	1·6						
Do.	8 hours' natural draught	·855	8	626	18,700	149	149	4	18	Not used	56	13·5	140	53	10	54·0	28·55	12·3		·65	28·1	136·15	8,208	35·6	11·2		28·5	2·4						
Do.	4 hours' full power	1·025	8	626	18,700	151	147	7	14	Not used	65	16·5	146	53	13	66·55	30·45	13·5		·75 to ·69	27·9	144·95	9,840	40·1	14·0		Not taken							

(a) At 67·35 revolutions. (b) At 108·08 revolutions. (c) At 118·78 revolutions (Mean of 3 runs over deep sea course). (d) Coal hand-picked, but very productive of clinker. Fires cleaned practically every 3 hours. (e) Mean of 1st two runs, 119·59 revolutions. The 1st two runs were made in slack water, and the 3rd against the tide, so that this is probably the more correct figure.

separators are placed in the boiler compartments instead of in the engine-rooms.

The usual stokehold fans, necessary to ensure a constant supply of air from the upper deck in all circumstances, and air-blowing engines for the purpose of supplying air in jets to mix the furnace and combustion chamber gases and assist the combustion, are fitted.

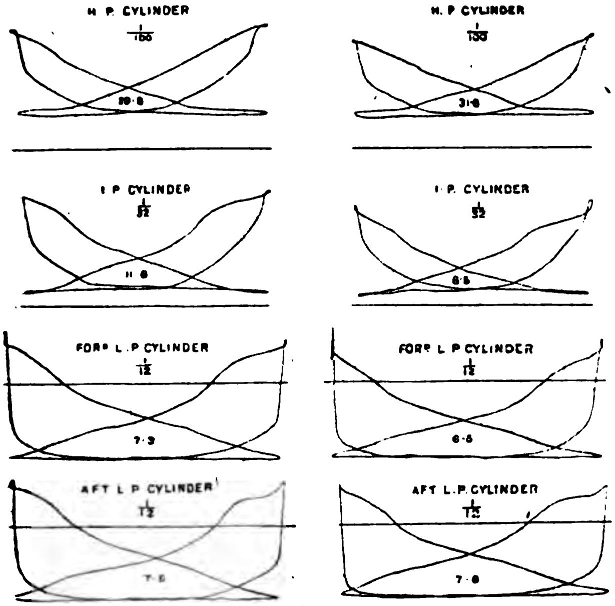
Table A gives the detailed results of all the trials carried out, and average sets of Indicator Diagrams are shown on Figs. 3, 4, 5 and 6.

The first trial was the contract thirty hours' trial at 3,300 I.H.P., *i.e.*, one-fifth the designed maximum power, and the results are given in column.

Eight boilers with eight elements each out of the thirty boilers were used, the mean power being 3,318, the coal consumption per I.H.P. per hour being 2·18 or 18·4 lbs. per square foot of grate per hour.

It should be observed that during this and all subsequent trials the necessary auxiliary machinery was at work, and the coal consumption includes the expenditure for this purpose, no deduction having been made on this account and no additions having been made to the I.H.P. shown by the main engines. The coal used, therefore, includes that for the auxiliary engines connected with the main engines—the evaporating apparatus (by Caird & Rayner), steering engine, and a 600 ampère dynamo supplying electric light to the whole ship.

The second trial was the contract thirty hours at 12,500 I.H.P., *i.e.*, about 75 per cent. of the maximum specified power, with all boilers in use. This trial was carried out in a very satisfactory manner, the power realised being 12,813, while the

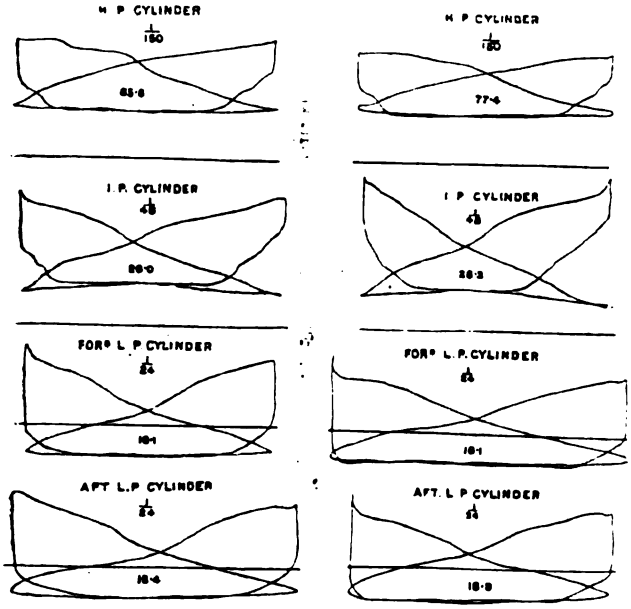


COLLECTIVE I.H.P 3201

Fig. 3.

Starboard Engine.—H.P.Recr. 165 lbs.; Vac. 27¾ ins.; Revs. 66·60; I.H.P., H. 433·69; I. 460·52; F.L. 379·22; A.L. 394·80. Total I.H.P. 1668·23.

Port Engine.—H.P. Recr. 158 lbs.; Vac. 27 ins.; Revs. 66.23; I.H.P., H. 463·34; I. 329·89; F.L. 335 78; A.L. 403·94; Total I.H.P. 1532·95.

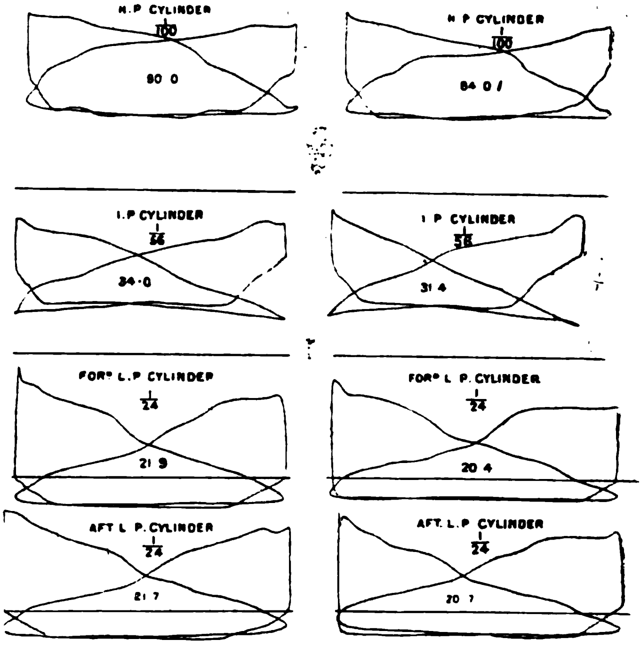


COLLECTIVE I.H.P 12859

Fig. 4.

Starboard Engine.—H.P. Recr. 239 lbs.; Vac. 26½ ins.; Revs. 108·78; I.H.P., H. 2046·2; I. 1658·5; F.L. 1366·0; A.L. 1391·5. Total I.H.P. 6462·2.

Port Engine.—H.P. Recr. 242 lbs.; Vac. 26½ ins.; Revs. 107·91; I.H.P., H. 1837·5; I. 1790·8; F.L. 1355·1; A.L. 1414·0. Total I.H.P. 6397·4.

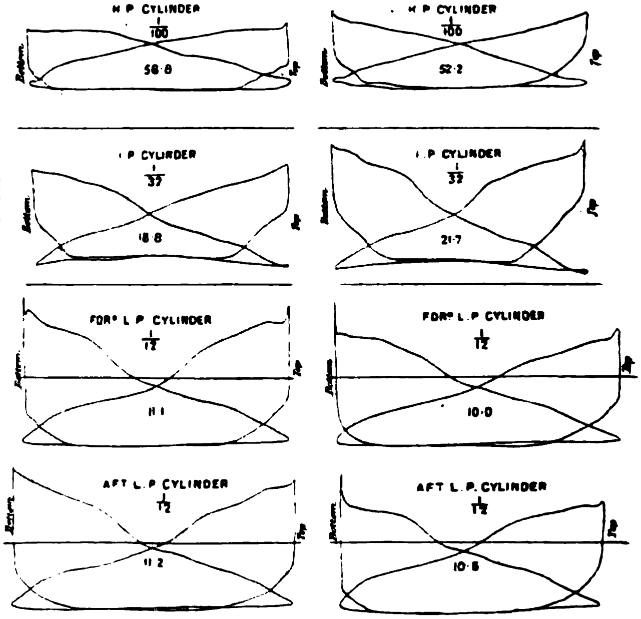


COLLECTIVE I.H.P 17080

Fig. 5.

Starboard Engine.—H.P.Recr. 245 lbs.; Vac. 27 ins.; Revs. 119·68; I.HP., H. 2369·6; I. 2386·1; F.L. 2044·3; A.L. 2025·6. Total I.H.P., 8825·6.

Port Engine.—H P. Recr. 243 lbs.; Vac. 26½ ins.; Revs. 119·73; H. 2212·6; I. 2204·5; F.L. 1905 1; A.L. 1933·1. Total I.H.P. 8255 3.



COLLECTIVE I H.P – 7211

Fig. 6.

Starboard Engine.—Steam 156 lbs.; Vac. 26 ins.; Revs. 88·40; I.H.P., H. 1104·6; I. 974·5; F.L. 765·3; A.L. 772·2. Total 3616·6.

Port Engine.—Steam 160 lbs.; Vac. 25½ ins.; Revs. 89·43; I.H.P., H. 1027 0; I. 1138·0; F.L. 697·5; A.L. 732·3. Total 3594·8.

coal consumption, taken as defined in the contract, for twenty-four consecutive hours, was 1·59 lbs. per I.H.P., or 13·9 lbs. per square foot of grate per hour. During this trial three runs were made over the measured long-distance course (23 nautical miles) between Rame Head and Dodman Point, when, with no wind and a calm sea, a mean speed of 19·70 knots was realised.

The boilers generated steam freely, the stokeholds being open and the fans not in use.

The third contract trial, *i.e.*, at 16,500 I.H.P. for eight hours, with all boilers in use, was carried out on January 26th, when a mean collective I.H.P. of 17,262 was obtained with open stokeholds and the ventilating fans running slowly.

The coal consumption was 1·76 lbs. per I.H.P., or 20·8 lbs. per square foot of grate per hour. The speed of the vessel was again tested by three runs over the long-distance course between Rame Head and the Dodman: 20·6 knots was the mean of the three runs; but, as the first two runs were made on slack water, and the third against a tide, there is no doubt that the true speed is higher than this figure. The mean of the first two runs was 20·72 knots.

In addition to the preceding contract trials the following experimental trials were carried out:—

In the first place it was desired to test the capability of these modified boilers when being pressed beyond the amount necessary to obtain the specified maximum power. For this purpose a trial of four hours was made on January 29th with the three after stokeholds only, the boilers in which amounted to 78 per cent. of the total boiler power of the ship, developing about the specified maximum power.

On this trial the H.P. realised was 15,861, the coal consumed per I.H.P. per hour being 1·95 lbs., and the coal burnt per square foot of grate 27·1 lbs. per hour. The boilers generated steam for this power satisfactorily, but accelerated draught was necessary to the extent of three-tenths in. of air pressure in the stokeholds.

With a higher air pressure, no doubt the proportion of boilers used would have generated a still higher power, but it was considered undesirable to press them further beyond the contract amount.

It will be observed that on this trial the combined heating surface in the generators and economisers was at the rate of about 2 square feet per I.H.P.

On February 10th and 11th similar trials were made with the same boilers, *i.e.*, 78 per cent. of the total boiler-surface, to test their capacity for maintaining for long periods a higher power than contracted for, and it was endeavoured to obtain with this proportion of boiler power the full continuous steaming power, *i.e.*, 75 per cent. of maximum power specified to be obtained with the whole of the boilers at work. This was successfully realised, and, with open stokeholds, 12,832 I.H.P. was maintained for thirty hours, the coal consumption per I.H.P. being 1 88 lbs. per hour, or 21·2 lbs. per square foot of grate.

On this trial the coal, although hand-picked, was of an inferior quality as regards quantity of clinker, which necessitated the fires being cleaned much oftener than usual. They were completely cleaned each eight hours, and this largely accounts for the difference in coal consumption between this trial and the corresponding one with the whole of the boilers at work. A certain increase would, however, be expected, due to the higher rate of combustion at which the boilers were being worked.

Another trial was made on February 7th of fifteen hours' duration under exactly the same circumstances as the first contract trial, with a view of confirming or otherwise the coal consumption then shown; but, unfortunately, the coal in the bunkers on this trial was much inferior, and produced a much larger amount of clinker: 3,266 I.H.P. was obtained, and the coal consumption was 2.35 lbs. per I.H.P., as against the 2.18 obtained on the original trial, and the difference between these two figures may be regarded as entirely due to the quality of the coal, and to the constant cleaning and clinkering necessary. On the succeeding ships of this class, two of which will probably be tried within the next three months, this question of consumption at one-fifth power will be further tested. With a larger proportion of boilers in use for this low power, say, twelve instead of eight, better results may be obtained.

A further trial was made of fifteen hours' duration on February 8th, to compare the powers developed in the engines, using 150 lbs. steam pressure, with that obtainable at 250 lbs. pressure, the cut-off in the cylinders being the same.

The trial selected for comparison was the second contract trial, and the links were therefore set at the same position as they were on the trial of January 21st, when an I.H.P. of 12,818 was obtained.

The mean power at this reduced pressure was 7,119, the revolutions being 89·5 as against the 107·6 on the original trial. The power was therefore about 60 per cent. of that obtained with 250 lbs. pressure. The coal consumption was 1·94 lbs. per I.H.P. per hour. As the same inferior quality of coal as regards clinker was used, this consumption is, no doubt, higher than would otherwise have been the case.

On all the contract and experimental trials the pressure of steam in the supply pipes to the auxiliary machinery was restricted by reducing valves to about 150 lbs. square inch.

On the trials of the *Powerful* and *Terrible* it was found particularly necessary to regulate the firing, while on the trials of the *Diadem* with the modified type of boiler such close attention, although beneficial, was found to be not so necessary, and more latitude in thickness and level of fire is permissible.

A comparison of weights per I.H.P. in recent designs, similar to that given last year in the case of the *Powerful*, is as follows:—

The *Diadem* and *Powerful* are compared in Table B with nine recent battleships with cylindrical boilers and 155 lbs. steam pressure.

TABLE B.

SHIP.	Indicated Horse-power.	A Weight of Machinery in Eng Rooms	I.H.P. per ton of A	B Weight of Propellers, &c.	I.H.P. per ton of B.	C Total Weight of Main Engines propl'rs, &c. =A+B	I.H.P. per ton of C	D Weight of Boilers and Fittings	I.H.P. per ton of D	E Total Weight of Main Machinery and Boilers. =A+B+D	I.H.P. per ton of E
Average of nine recent battleships...	10,000 (N.D.)	445 01	22.47	98·17	101·86	543·18	18·41	719·31	13·92	1262·49	7·92
	12,000 (F.D.)		26·97		122·23		22·092		16·706		9·505
Powerful	25,000	789·5	31·66	192·72	129·7	982·2	25 45	1162 05	21·51	2144·27	11·7
Percentage of increase over battleships	Compared with N.D.								54·52		
	Compared with F.D.		17·433		6 126		15·20		28·75		
Diadem	16,500	576·45	28·62	111·9	147·45	688·35	23·97	748·4	22·05	1436·75	11·48
Percentage of increase over battleships	Compared with N.D.								58·405		
	Compared with F.D.		6·16		20·63		8·501		31·98		20·778

It will be seen that the percentage of increase per ton weight of boilers and fittings, comparing the full power of the *Diadem* with the natural draught power of the nine battleships, is 548· per cent., while in the *Powerful* the corresponding figure is 54·5 per cent.

Comparing the *Diadem* and the *Powerful* the specified power in the latter was 31·66 I.H.P. per ton of machinery weights in engine-room, while in the former it was 28·62, the heavier weight of the *Diadem* engines being largely accounted for by the larger ratio of cylinders fitted, *i.e.*, a ratio of 7 to 1 against 5·7 to 1.

A series of trials in connection with the auxiliary machinery, which were carried out in the vessel while in basin, preliminary to these speed and power trials taking place, will now be referred to.

The coal consumption for auxiliary purposes, *i.e.*, for purposes not required simply for propelling the vessel, as reported in some recent ships, was considered abnormally high, and the opportunity was taken to test the quantities of steam or coal required for such purposes only, by a series of trials with the engines at rest and the ship in the basin.

These trials were made with two boilers in use, each trial being of eight hours' duration, and the amount of coal burned was measured when various combinations of auxiliary engines were at work. For example, trials were made with certain auxiliary engines in use, and also the electric light installation and distilling plant, and the trials were repeated with these latter engines stopped, so that by a process of subtraction the amount of coal used by the electric light installation was ascertained.

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TABLE C.

Duration of Trials. Hours.	Boilers in use. Nos.	Distinguishing Letter of Trials.	Steam Pressure, Lbs. per sq. in. Boiler Room	Steam Pressure, Lbs. per sq. in. Engine Room	Blowing Engine (One Steam Cylinder 9½ in. dia., 9 in. str.) Revs. per min.	Blowing Engine, Pressure of Air, Lbs. per square in.	Electric Light Engine (Steam Cylinders H.P. 7½ in. dia., 9 in. str. and L.P. 1· in. dia., 9 in. str.) Revs.	Electric Light Engine, Volts.	Electric Light Engine, Amp.	Auxil. Circulating Pump (One Steam Cylinder 7 in. dia., 7 in. str.) Revs. per minute	Refrigerating Engine (Steam Cylinders H.P. 5½ in. dia., L.P. 10½ in., str. 11 in.) Revs.	Feed Engine (One Steam Cylinder 10½ in. dia., 18 in. str.)	Evaporator Primary Steam Pressure per sq. in.	Distiller Pumps (One Steam Cylinder 6 in. dia., 7 in. str.) Revs. Starbd.	Distiller Pumps, Revs. Port.	Water Made * Gals. per hour	Total Water made including Coil Drain † Tons per day	Pounds of Water evap. per lb. of Coal	Water pumped from Feed Tank. Lbs. per hour.	Coal Consumption, Lbs. per hour.	Coal Consumption, Tons per day	Distinguishing Letter of Trials.	Remarks.
8	1 & 2	A	280	279	96·1	6·6	309	79·9	599·3	85·3	..	From 1 to 3 double strokes per minute.	147·5	78·1	83·5	367·6	39·6	Not taken	Not taken	976	10·4	A	The whole of the coal used was carefully weighed on all the trials. No fires were cleaned during the trials. As far as possible the condition of the fires at the end of the trial was the same as at the beginning, but there was some slight variation in this owing to the short time available between some of the trials for cleaning and getting up the fires afterwards.
8	1 & 2	B	286	274·8	80·4	6	..	.		94·6	..		108·0	80·8	80·6	170·6	41·9	..	..	620	6·6	B	
8	1 & 2	C	280·4	274·9	71·6	5	..	.		* 82·9	..	..	..	..	.	..	..	.	..	330	3·6	C	
6	1 & 3	D	150·6	150·1	72·3	5	..	..	..	81·3	..	..	..	..	.	..	..	..	..	337·5	3·5	D	
8	1 & 3	E	280	275·3	72·0	5	..	.	..	82·25	..	.	..	.	.	.	..	..	..	525	5·6	E	
8	1 & 3	F	150	150	73·7	5	.	.	.	70·6	..	..	.	..	.	..	..	..	..	319·5	3·8	F	
8	1 & 3	G	160	156·3	73·6	5	300·7	80	600	92·8	..	..	112·7	79·7	78·4	236·1	56·5	8·79	7286·0	826	8·8	G	
6	1 & 2	H	160	155	73·8	5	304	80	600	85·7	..	..	..	..	..	..	.	7·39	6160·0	573	6·1	H	
8	29 & 30	I	160	155	73·6	5	309·6	80	600	81·9	..	..	112	78·7	79·1	196·6	47·8	10·36	7036·0	662·5	7·09	I	
8	29 & 30	J	160	155	73·0	5	315	80	600	80·5	..	..	..	.	..		.	10·91	5710·0	360·5	3·86	J	
8	1 & 2	K	160	155	73·6	5	300	80	600	82·3	.	..	118·1	79·0	79·4	208·8	49·06	9·96	6947·6	775	8·3	K	
8	1 & 2	L	160	155	73·87	5	320	80	600	81·9	..	..	117·1	78·0	79·0	216·8	52·08	9·10	7480·0	812·5	8·7	L	
8	1 & 3	M	180·6	179·4	100	5	315	80	600	119·3	110·9	.	.	.			..	..	.	350	3·75	M	

Auxiliary Machinery in Use on the Several Trials.

On Trials A, G, I, K, and L.—1 Main Feed Pump, 1 Blowing Engine, 1 Auxiliary Circulator, 1 Electric Light Engine, 2 Distiller Pumps, and 2 Evaporators working compound.
On Trial B.—Same as A, G, I, K, L, with the exception of Electric Light Engine being stopped.
On Trials C, D, E, and F.—1 Main Feed Pump, 1 Blowing Engine and 1 Auxiliary Circulator. In addition on trials E and F the main steam pipes were kept filled with steam at the boiler pressures given.
On Trials H and J.—Same as G, except that the Evaporators were not in use.
On Trial M.—1 Main Feed Pump, 1 Blowing Engine, 1 Auxiliary Circulator, 1 Electric Light Engine, and 1 Refrigerating Engine.

* Measured water made per hour. † Estimated from Column*

The figures on Table C give a summary of the results obtained. They are not uniformly consistent, and, in considering some of the figures, allowance must be made for the inevitable variation in stoking and possible differences due to variations in the conditions of the fires at the beginning and end of each trial, and to the small quantities of coal burnt per square foot of grate.

The figure 3·75 tons in trial M, even assuming it may be slightly under-estimated owing to varying conditions above mentioned, indicates a high economical performance in both the engines and boilers in use, particularly as deductions must be made for coal expended in simply maintaining pressure in the large system of pipes in use (suggested by trials C and D).

It will be seen by comparing trials G with I, and H with J, that the length of steam pipe in use has an important bearing on the coal consumption. The conditions in G and H were the same as in I and J respectively, except that two of the extreme after boilers were in use in the latter trials, and two of the extreme forward boilers in G and H. A saving of 20 per cent. to 30 per cent. of the total coal used was effected by the use of the after boilers, *i.e.*, those with the shortest steam pipes.

A comparison of trials A and G, in which latter a saving of 15 per cent. of coal is effected over trial A by using a lower pressure of steam, indicates that it is not desirable to use the higher pressures of steam which can be carried in the boilers when working the auxiliary engines, and this lower pressure of steam was used on the subsequent trials under way. The main engines are designed to work at the high grades of expansion necessary for obtaining the increased economy to which the high-pressure steam lends itself; but, as the degree of expansion in many of the auxiliary engines is either non-existent or very limited, particularly in such engines as feed engines, blowing engines, and auxiliary circulating engines—which are simple engines with very late cut-off, no advantage is obtained by increasing the pressure beyond that which is absolutely necessary to obtain the full work out of the engines in use. In the present case that pressure is about 155 lbs. in the electric light engines, and 170 lbs. in the refrigerator engines, both these engines having compound cylinders.

Assuming a water consumption for the electric light engine of 30 lbs. per E.H.P. per hour and an E.H.P. of 64, with an evaporation in the boiler of 9 lbs. of water per pound of coal, the coal equivalent of the electric light engine works out to 2·4 tons per day.

The difference between C and A gives 7·8 tons as the coal expended on electric light and distilling, and deducting 2·4 for electric light we have 5·4 tons for making 59·69 tons of water, or 11·1 tons of water per ton of coal.

Again, the difference between C and B = 4 tons, which was expended in distilling 41 tons of water, or 10·25 tons of water per ton of coal, a result agreeing well with the figure previously given, the difference pointing probably to a slight reduction in efficiency due to the scale formed on evaporator coils.

In conclusion, it is submitted the trials carried out in the *Diadem*, which have been neither few in number nor generally short in duration, have shown that the engines and boilers are economical and efficient for warship service, and the fitting of the economiser to the boilers has been attended with beneficial results.

DISCUSSION.

Mr. Seaton: My Lord and Gentlemen,—There is no doubt that we are very much indebted to Sir John Durston for coming forward in the frank and candid manner in which he has to give us the benefit of the recent experiences with the Belleville boiler. The subject, as all of us who are assembled here know, has been in the past a very prickly one, and one that has very often led to acrimonious discussion. On the part of Sir John we have never witnessed anything of the kind. He has always been most free and liberal in giving us information and receiving the severest of criticisms perfectly kindly and good-humouredly. I cannot help, however, alluding to one point in his paper which I think is a most important one. Of course as the paper is peculiarly one on boilers, perhaps he has not touched upon it as extensively and seriously as I think he might have done, and that is the enormous consumption in the auxiliary engines of a warship. We find in the Mercantile marine, with the same system of auxiliary machinery, a smaller wastefulness. The fashion in late years has been for direct working pumps, or perhaps I had better call it by the name of its original inventor, the Weir system, and with engines afloat it is undoubtedly a most beautiful one. No one who has had experience with the Weir pump can fail to admit that as an instrument for supplying water to the boilers with the least amount of care and anxiety, it is unequalled; but I am afraid to say it is unequalled in another respect, and that is in the consumption of steam. You cannot eat your cake and have it too. If you will have a pump which is very efficient as a pump; as a supplier of water to the boilers, and at the same time a pump that does not give the engineers or everybody concerned the least anxiety, you must be prepared to pay something for it, and you must not lay the blame on something else. Unfortunately—I do not say here, but in another assembly—it is not an uncommon thing to lay the failure of every instrument in the Navy down to the unfortunate Belleville boiler, and in this respect the pumps are no exception. We have recently had trials with the *Arrogant* cruiser, fitted with the Belleville boilers, but without the economisers. The good working of the boilers was unquestioned, and the confidence with which the men worked the boilers is, I think, also unequalled in the annals of steam engineering. The free and easy way with which both the engineers and the firemen treat these boilers is something almost to marvel at; but in spite of having a very successful trial, and one conducted with practically no hitch, the fuel consumption, for which we as contractors had to pay, was a little bit alarming to me. Further investigations were made at the expense of the Admiralty, and it was discovered that the one great source of loss was in the auxiliary machinery, for not only are the auxiliary feed pumps, but the blowing engines, the auxiliary feed pumps which pump the bilges and supply water to the deck—which are all of the same type—all great users of steam, but at the same time they work remarkably well. Now I think it would be very well worth the while of some engineer members of this Institution if they would turn their minds to the invention of a pump which will do its work as a feed pump satisfactorily, and in all respects with the same ease to the mind of the engineers as the Weir system, but that either by this compounding or by some other arrangement the consumption of coal shall not be nearly so heavy. There is another point to which perhaps attention should be called, and it is becoming a serious one, that is the very great loss through radiation from the imperfect nature of the material that we now put on boilers and pipes. The old days of felt are practically gone. We have to resort to other materials, and though in themselves they are very good, the difficulty is so to apply them that they should do the duty expected of them without loss from other causes: for instance, the various asbestos compositions are exceedingly good as non-conductors of heat, and we can, of course, apply them more or less satisfactorily to pipes and other hot surfaces; but they very soon begin to lose their efficiency from the incomplete attachment to the hot surface and also to the metallic bodies, used to hold them in place, becoming very quickly conductors of heat. We have been recently scheming some method of coating the pipes and casings of these boilers to avoid this, but it is a most difficult thing to get perfect insulation, and it is astonishing how much heat will pass away through a very small section of metal which is in direct contact with either the pipe or the boiler casing. There is no doubt that these two things combine to make the very high pressure system now used in the Navy and Mercantile Marine a somewhat costly one, but I do not think it should deter either the steamship owner or his advisers any more than it deters Sir John Durston and his assistants from pursuing the course of perfecting that which we know will eventually give unmeasured success. The steam pressures that are best used in water-tube boilers are naturally very high. The reducing valve, which perhaps is a readier of steam supply and a controller of it rather than a mere reducer, of course helps matters somewhat, but at the same time it tends to superheat the steam and make the temperature of that issuing from the reducing valve almost as high as the steam before it reaches it. Now if we are to have the advantage of this hot steam, and practically dry steam, we must follow up very closely the methods for controlling the loss and preventing it, not merely turn our back on things and say it is a failure, and it is no use going on with it. There is no question in my mind that the economiser was the great thing needed to make the Belleville boiler a practical success. Any one who has had experience with the original design knows that the heat at the funnel base was not only high but apt to be irregular, and that the flaring at the funnel was notorious with that class of boiler. The introduction of the feed into the upper casing, as Sir John Durston has very clearly shown you, cured both those evils, and I have no doubt that if the *Powerful* and the other vessels now fitted with the ordinary Belleville boiler can have some modification of the economiser or feed heater, that the consumption of fuel in them would be proportionately reduced to that of the *Diadem*. The question of feed heating of course has always had an attraction to engineers, but I do not think, until recently, sufficient attention has been paid to the fact that the efficiency of the heating surface of either the feed heater or the boiler must depend on differences of temperature. I had the pleasure last year of witnessing an experiment with Mr. Yarrow's boiler, about which he has been good enough to give us a paper this year, and it was impressed on my mind that which had only been rather hazy before, the very great gain which could be obtained by paying a little attention to that fact.

Mr. Richard W. Allen: My Lord and Gentlemen,—I did not intend to make any remarks on this paper, but as Sir John Durston has mentioned the auxiliary machinery in H.M.S. *Diadem*, I trust I may be allowed to say a few words, as my firm designed and constructed most of the auxiliary engines. Since the trials have been carried out on that ship I thought it would be of interest to the Institution and to Sir John Durston to make some trials at our works with the auxiliary machinery we are constructing. Several members have pointed out that little attention has been given of late years to the steam consumption of auxiliary machinery. I may mention that in 1884 (I think that was the year when the first electric light engine and dynamo was fitted in H.M. service), the steam consumption of the engine and dynamo was 140 lbs. of water per electrical H.P. per hour. During the present year we have constructed the electric light machinery for H.M.S. *Amphitrite*, and on the official trial the steam consumption of each of the electric light engines, when working non-condensing for the above ship was 27 lbs. of water per electrical H.P. I think this comparison will shew that some attention has been paid to the economy of electric light machinery. With regard to the main circulating pumping engines, I think they come next in size amongst the auxiliary machinery attending the main engines. In the *Diadem* each of the four main circulating pumping-engines is capable of developing 80 H.P. No doubt we could reduce the steam consumption of these engines if the power of the engines was reduced; but the specification states that we are to pump out the bilge with the same engine as used for circulating, and when such large power has to be allowed for in the cylinder capacity it is difficult, and, in fact, impossible to obtain economical results when working circulating, as only about one-fifth part of the original power is required. In regard to the fan-engines, we have made many hundreds of tests of every kind, and we find that ordinary single-cylinder fan-engines consume about 50 lbs. of steam per I.H.P., having a cut-off of 40 per cent. of the stroke. Most of the specifications state that the fans and engines, at the official trial at the maker's works, are to run "in the open" (that is, without a casing to the fan) at a much higher speed than in actual practice. To effect this, you have to allow a large cylinder area, and when the fan is running with a casing at a lower speed than the test speed, the cylinder is often 50 per cent. too large on account of the fan requiring much less power to drive it when fitted in a case. If we could proportion the size of the cylinders of all the auxiliary engines more to the actual work they have to perform in practice, and also arrange an earlier cut-off, I am sure a greater saving in the steam consumption throughout the auxiliary engines would be gained. With respect to the furnace air blowing engines, I think the results are the most startling we have found out lately. Take, for instance, those we are now testing for the third-class cruisers. Six are fitted in each ship. We find that at the lowest speed at which the engines would run, viz., 38 revolutions, the steam consumption per I.H.P. is 200 lbs., while the I.H.P. is only 3; and the maximum H.P. of these engines, when working at 30 lbs. pressure, is 35 lbs.; and the steam consumption per I.H.P., when working at full power, is 50 lbs. Now, this engine was taken out for 30 lbs. pressure, but it looks to me that the efficiency of the pump would be greater if reduced to 15 lbs., when the total steam consumption would be reduced by nearly 50 per cent. A great saving in the total consumption would, no doubt, be effected when working at 15 lbs. pressure of air instead of 30. The total steam consumption of each engine when working at full load with 15 lbs. of air is 1,000 lbs. per hour, or 6,000 lbs. for six blowing-engines per ship. Mr. Seaton mentioned the reducing-valves as fitted on board ship. I think it would be well if we would persevere in regard to these fittings. We have made several trials lately and find that with 220 lbs. of steam we obtain the same steam consumption working direct from the boiler without the reducing-valve as with it, fitted with 150 lbs. of steam. These figures shew that a reducing-valve has some effect, and keeps back the particles of water which otherwise pass over with the steam to the engines. I think these remarks are all I wish to make.

Mr. Macfarlane Gray: My Lord, I did not intend to have said anything on this paper, and my remarks will refer to the economiser only. In the economiser we have the feed heated to almost the temperature of the steam, and Mr. Seaton has been recalling the words of Mr. Yarrow, as I understand him, that the efficiency of the heating surface depends solely upon the difference of temperature between the heater and that which was to be heated. Now I thought so too for many years, and I used to laugh at the idea of people heating feed with sharp steam, but I am forced to admit that I had been in error, and that there is actually economy in so heating by steam; which proves to me that efficiency does not depend entirely upon the difference of temperatures. In this economiser we have the feed heated in a separate boiler as it were. This is 1898—two hundred years ago this year there was a patent taken out by Captain Savery, a London shipmaster, for the first commercially successful steam boiler and engine, the first of a series of which we have the continuation before us in the Belleville boiler, and it has escaped attention for all this time that that first boiler consisted of two boilers, one to heat the water up to the temperature of the steam, and the other to evaporate it. Savery's boiler was a heater and an evaporator, and that is what we must come back to. Mr. Druitt Halpin, who has introduced thermal storage, made an experiment to see how much he lost in efficiency by his heating the water during the day in a separate chamber, to be used at night in electric installations—heating the water while there was no other use for the boiler—and to his astonishment his assistant brought him word that there was some mistake and that there was a 16 per cent. gain. "Oh, nonsense; get away with you, we must do it over again!" They did it over again, and there was still 16 per cent. economy. They could not understand it. He applied to Professor Unwin. Professor Unwin made the experiment at Margate, and said he also could not understand it; there was 19 per cent. economy. He did it twice over and there was still 19 per cent. economy. But how was the economy produced? It came before me. I said, "I see I have been wrong—we have all been wrong about this. I see now where it is. You have immensely increased the efficiency of the heating surface; for, no doubt, the heat was taken out of the smoke. That is where it comes from. You, in effect, immensely increase the heating surface if you supply the water at the temperature of the steam. Then, any fraction of the addition of heat which the water receives, must make a correspondingly small particle of it into steam at once; whereas if you supply the water at 100° lower temperature than the steam, that water has to lie inactive until you get it hot enough to make it into steam. You all know the marked difference between the efficiency of the heating surface with water which is moving rapidly past it and that which is standing still. You enormously increase the efficiency of the feed heater. It is that which takes place. The efficiency of the heating surface is enormously increased when it has nothing to do but to turn the water into steam. It is the latent heat only which has then to be added. One of Savery's boilers supplied the latent heat and the other boiler supplied what is vulgarly called the sensible heat, this is what we must come back to. No heat ought to be applied to the water in a boiler through a metallic heating surface, except latent heat. In the boiler of Halpin he heated the water by steam from the same boiler up to the temperature of the water in the boiler, and then he got 19 per cent. economy. I ought to state that I have heard since that Professor Elliott, of Cardiff, wrote a paper some years ago in which he pointed out that the thermal economy of steam-heated feed was due to the increased efficiency of the heating-surface of the boiler by reason of the increase of rapidity of circulation thereby produced. I have not seen the paper, but it is due to him to mention this; and Mr. Seaton tells me he also pointed it out some years ago.

Mr. Frederick H. Sawyer: My Lord, the only point on which I wish to make any observation is with regard to the distilling apparatus which forms an important portion of the auxiliary marine machinery of a battleship. I read here that 11 tons of distilled water is given by the consumption of one ton of coal, but I wish to say that it is perfectly easy to obtain a much greater quantity of water than that from the consumption of a ton of coal. In the works of which I recently had charge, I constructed for Sir Alexander Rendel an evaporator which is now at work in Uganda, which was a sextuple effect, and which evaporates 35 tons of water per ton of coal. It is true that the increase in weight and possibly in bulk would be a disadvantage on board a cruiser or battleship, but on the other hand if you consider that you might obtain three times the quantity of distilled water per ton of coal used, and that this apparatus is frequently, if not continuously at work, I venture to say that the saving in coal and consequently in weight and space on a very short cruise would make up for the extra weight put on board, and the extra space which would be occupied. With regard to Mr. Macfarlane Gray's remarks I might say that we have been for years at The Mirrlees Watson & Yaryan Co.'s works in Glasgow making evaporating apparatus, every vessel of which was fitted with a heater, so that, as he says, there were evaporators and there were heaters, so that whatever the temperature of the evaporator was, and that depended, of course, upon the vacuum maintained, the water, or the liquid, whatever it was that entered into this evaporator, was immediately evaporated, or rather the evaporator was not troubled to do any heating—it only had to supply the extra portion of heat which was necessary at once to turn the liquid into vapour. I think, my Lord, that is all I have to say.

Mr. Yarrow: My Lord, there is only one point on which I would like to make any remark, and that is that owing to the large loss through the auxiliary machinery, it is customary sometimes to pass the exhaust from these engines into the reservoir of the low-pressure cylinder. That compounds all the engines without any increased complication. I should very much like to know whether there is any insuperable difficulty in that being carried out in a large warship.

Sir John Durston: My Lord and Gentlemen—the object of relating these experiments which we have recently made on auxiliary machinery has been, to a certain extent, fulfilled by the remarks made by the gentlemen present. I should have liked to have heard, and have gathered the experience of a larger number; but, as Mr. Allen has said, we know the water consumption of electric lighting engines for electrical H.P. has been closely watched for many years with, as he states, the very satisfactory reduction from 140 lbs. down to 27 lbs. Of course, as you can see, the electric light engine we can easily compound. It will do its work as a compound engine as well as a simple one, and the same thing applies to the refrigerator engines on board ship. They are doing constant work, but when you come to the feed pumps and circulating engines, fan engines and air-blowing engines, it becomes a question of space, and if we think of the steering engine, then it becomes a question of efficiency; because the higher you compound an engine the less handy it is to do its work. But in reply to Mr. Seaton, I might say that we are continuing experiments at Portsmouth and trying various coverings and amounts of covering, and various kinds of covering are being used as non-conductors of heat. As we try the auxiliary machinery of different ships we shall gradually accumulate some valuable information, which I shall have much pleasure in putting before the Institution when we have had time to think it over. Then as to distilling plant, Mr. Sawyer has rightly drawn attention to the fact that it is quite possible to get 35 tons of distilled water from a ton of coal. That confirms our previous experience of many years ago in the last Egyptian campaign, where you could put in distillers with triple or quadruple effect. We have had the same experience, but then again the question of space and weight comes in for use on board ship. Of course, the point I have shown—and I expect it will be confirmed by further experiment—is that with these engines that we do use of a simple type, it is more economical to use them just at that pressure which is sufficient for them to do their work. Mr. Yarrow has referred to the question of passing the exhaust into the low-pressure cylinders. The objection to doing that in warship machinery is the difficulty of manipulating the engines. We do not make a voyage from one place to another for the sake of making the voyage under the best circumstances; but the machinery must be entirely subordinate to the varying purposes of the ship. You may, at any moment, have to go to quarters, or to target practice, or anything of that sort. The engines are slowed down from what they have been set at, and you would then add considerably to the number of things to be looked after when the alteration of the speed of the engines takes place; otherwise, we might be very glad to make use of the principle of using up the exhaust steam. We are thinking out the desirability of taking up some of the heat in the way of feed heaters and such like apparatus. We made a trial a little while ago illustrating the excessive expenditure in auxiliary machinery with a higher pressure of steam. On the *Arrogant*, we made a 30 hours' trial at 1-5th the maximum H.P. The result was 2·1 lbs. of coal consumed per I.H.P. for the main engines and 8 lbs. for the auxiliary. That is the *Arrogant* working at 300 lbs. of steam. In the *Venus*, working at 150 lbs. of steam, we had a 30 hours' trial at 1-5th power. The consumption for the main engines was 2·1 lbs. per I.H.P., and the consumption for the auxiliary service came out at ·4 per I.H.P. of the main engines. You see that in the *Arrogant* with the higher pressure the consumption for the auxiliary purposes was just double what it was in the *Venus*.

Mr. Seaton: There would be no blowers in the *Venus*.

Sir John Durston: No, there were no blowers in the *Venus*. This is only an isolated instance. I have not given one other piece of information, but I hope to do so later on, and that is the information with regard to the trials made at Paris on the boilers ashore, and also the trials made on the boilers ashore at our various contractors' works. That will come when we get more examples. Of course, if we get a large number of examples the results are more trustworthy than with only a few. I beg to thank you, gentlemen, for listening to my paper.

The President: I feel certain, gentlemen. that you will desire to accord a hearty vote of thanks to Sir John Durston for the very interesting paper which he has read.

THE "RAPIDE" HIGH-SPEED ENGINE.

THE "Rapide" Engine Co., of 30, Brunswick Street, Liverpool, are manufacturing a very simple and compact high-speed engine, which is applicable for a variety of purposes. We illustrate this engine in the adjoining diagrams, of which Fig. 1 is a diagrammatic view of the working parts; Fig. 2 is an outside elevation of the engine coupled to a centrifugal pump; and Fig. 3 is an outside elevation of a compound engine coupled to a dynamo.

The special features of the design are:—1st, its simplicity, which reduces the first cost of the engine, reduces its liability to get out of order and permits of easy overhauling. 2ndly, its accessibility, rendered possible by the large doors in the casing, which is an important feature considering the small floor-space occupied. 3rdly, the working stresses are small in amount, as all the bearings are very long and are fitted with white metal, and further, the connecting-rod is longer than usual in engines of this class.

It may be mentioned that special attention has been paid, in designing all moving parts, to have the minimum of weight with the maximum of strength, so that the engine may run steadily at high speeds and give a high mechanical efficiency. The distance-piece between the cylinder and the casing is put in as an absolutely necessary essential when the engine is working on a condenser in order to prevent oil passing to the condenser and thence to the boiler. As will be seen from the diagrams, the engine is single-acting, all parts being in constant thrust, permitting any speed without knock, and allowing the engine to run quickly for an indefinite period without any necessity arising for adjustment or taking up of wear.

As all the parts are covered in, the engine specially adapts itself for use in situations such as stokeholds and other places where coal dust, ashes, etc., are floating about, rendering the use of an open type of engine impossible.

Oil is put into the casing of the crank chamber of such a depth that the crank pin dips into it at every revolution, so that the oil is splashed all over the guides, crosshead, eccentric, and bearings, which latter have no caps. It will be seen that, by the insertion of the distance-piece between the cylinder and crank-chamber, the portions of the piston and valve-rods which enter the cylinder do not enter the oil chamber, thus forming an absolute preventative against the passage of oil from the casing to the cylinders, which would otherwise occur when working on a condenser.

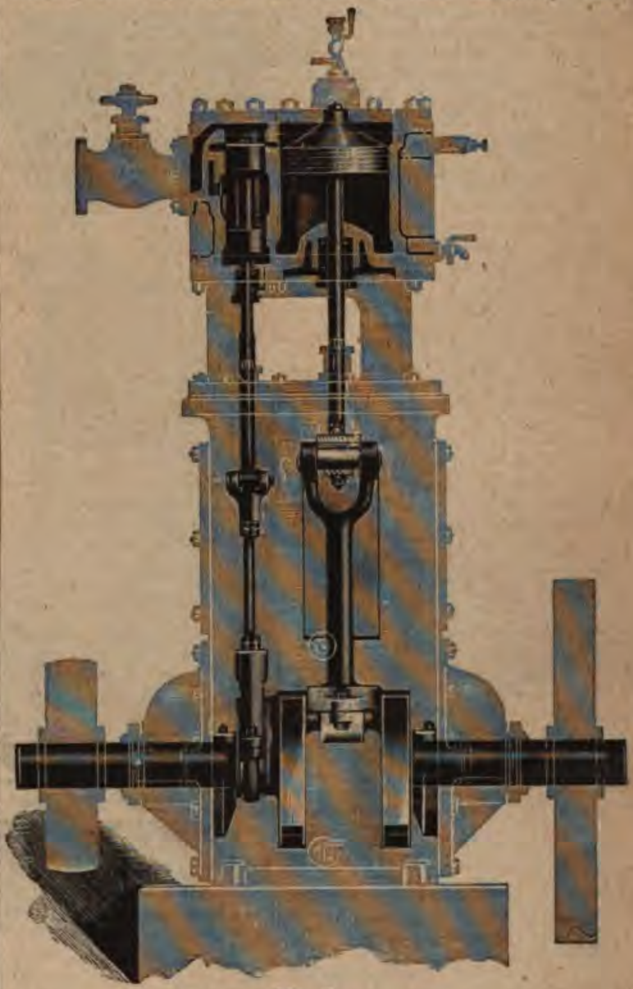


FIG. 1.

The top cover of the cylinder is shaped to fit the piston, giving a clearance of not more than 1-32nd of an in., the slide-valve is of the piston type, and the crosshead guide is of the trunk form cast integral with the casing. It will be noticed that the double-glands give the slide-valve rod very efficient guidance.

The engine appears, in every respect, to have had considerable thought and ingenuity displayed on its design, with the result that it seems extremely applicable for the particular purposes for which it is intended.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

The Question of War.

DURING the month of April the question which has chiefly agitated the public mind has been the strained relations between the United States and Spain in regard to the question of Cuba. We have seen the political horizon growing darker and darker till no ray of hope has been discernible. The conflict between two such powers must inevitably in the first instance be on the sea. It must also to a very large extent affect the Fleets of the Mail Lines. In the first place the Powers affected have largely recognised the value of mail steamers for purposes of war, even though some of our British arm-chair and service experts have thrown doubts on the value of such auxiliaries to ourselves. We have seen no such hesitation on the part of either of the nations in question. The four great mail steamers of the American line were the first called upon by the nation whose flag they bear, and whose postal subvention they receive. The *St. Paul* arrived at New York under Captain Jamieson in her usual course on Saturday, the 16th April. Acting under orders from headquarters, cargo and passengers were quickly discharged, the saloons and state rooms were stripped, Captain Sigsbee, late of the ill-fated warship *Maine*, assumed the command, and within twenty-four hours of her arrival she was off again for Philadelphia, where the work of fitting her out for her new duties was to be accomplished. The same day saw her sister the *St. Louis* start in regular course from Southampton. A few hours after she sailed, the reserve ship *New York* followed her in ballast and without passengers to fulfil her duty to her country. The *Paris* and the *St. Louis* are also requisitioned. It would appear that the vessels are not likely to resume their more peaceful occupation for some time to come, as two of them have had their names changed. There is already a *New York* in the United States Navy. To prevent the possibility of confusion the new recruit is henceforth to be known as the *Havard*, whilst her sister, whose name makes little appeal to the patriotism (though it may be connected with the pleasure) of Americans, is, in future, to be called the *Yale*. *St. Paul* and *St. Louis* are, of course, thoroughly American designators, and do not therefore call for any change.

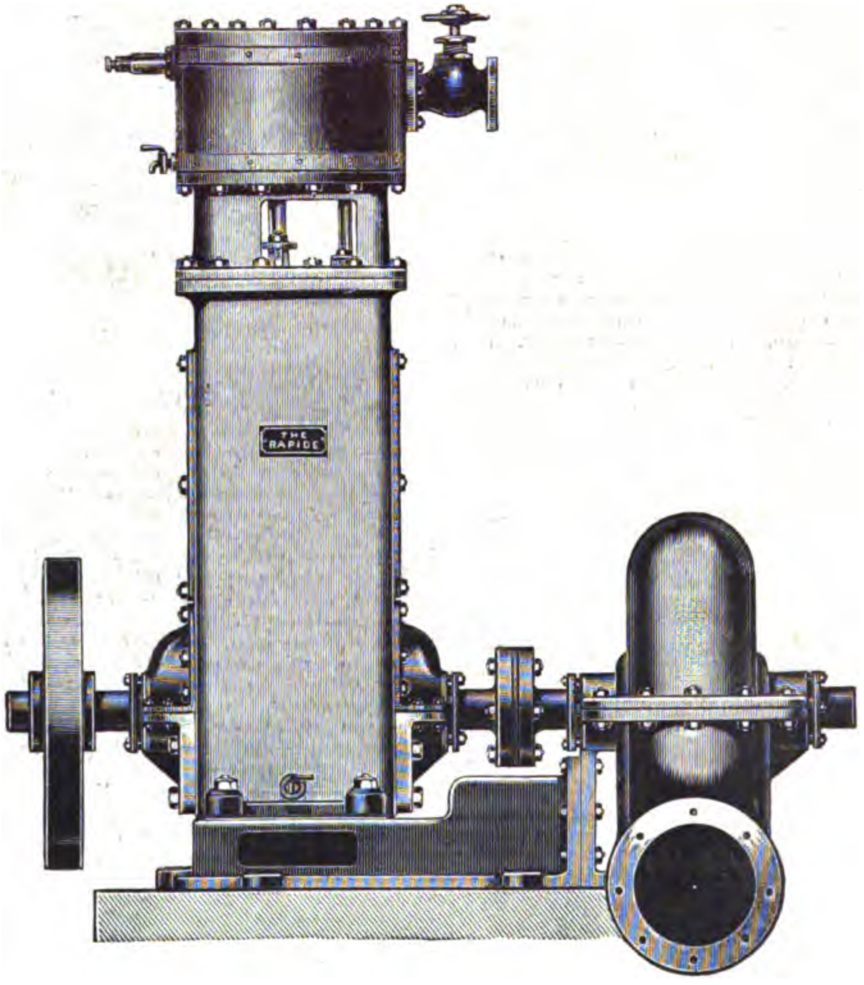


FIG. 2.
THE "RAPIDE" HIGH-SPEED ENGINE.

Many rumours have flown about as to other purchases. We were told that the Lancashire and Yorkshire and London and North-Western Joint Service between Fleetwood and Belfast was to be denuded of some of its fast boats. That the Great Western Channel Islands service would yield its new vessels *Roebuck* and *Reindeer*, that the Isle of Man Company was to hand over its cracks *Empress Queen* and *Tynwald*. But all these reports have been circulated only to be indignantly denied. But we do know for certain that Mr. H. McCalmont has parted with his magnificent twin-screw yacht *Giralda*. She is a vessel of about 1,200 tons. Her age is about four years, and her speed is very high. The same Power has also purchased the *Normannia* and the *Columbia* (which are already now in Spanish waters), from the Hamburg-American Company. It is said that the premier vessel of that line, the *Furst Bismarck*, has been acquired by the American Government. As to the vessels of the other German line many reports have been made only to be contradicted. It was said that the *Spree*, the *Saale*, and the *Kaiser Wilhelm der Grosse* had all been handed over to the militant powers. These tales, at least as regards two of the ships named, did not bear much evidence of probability. War, dreadful as it must be in these days of high explosives and of great advance in the weapons of destruction, cannot be expected to stop the whole traffic of the Atlantic. There is no doubt a price which would tempt the North German Lloyd Company to part with their record-breaker, but it would certainly be high; especially high would it be when so many of the competing vessels are removed from the passenger business. Then as to the *Spree*, we are all aware that a contract regarding her has been made for very large and important structural alterations. The contractors would rightly demand to be indemnified for the loss of their business, and that compensation, coupled with the price that the owners themselves would necessarily demand, made it highly improbable that the story, as far as she was concerned, could be accepted. So the event proved, for the story was promptly contradicted.

So much for the moment on the question of transfer. Now let us have word on the other question of the

Position of British Steamships

under the conditions of war. To a certain extent it is obvious that benefit would accrue. For though the volume of trade would naturally be much constricted—the purchasing and spending power of so many customers being greatly crippled—what trade continued would tend to go very largely under neutral flags, and especially under the neutral flag which commands the greatest sea power. There is a likelihood too that much traffic will be diverted to Canadian ports. But this is by no means the only or even the most difficult aspect of the case. Maritime affairs have greatly changed since a war between great naval powers. The volume of trade has immensely increased in every direction, and ships have vastly multiplied upon the sea.

Now a grave question of International Law bears very strongly on our position here. For most civilised Powers were parties to the famous Treaty of Paris, signed in April, 1856, after the close of the Crimean War. By it four declarations were made. They are, briefly, as follows:—

(1) Privateering is, and remains, abolished.
(2) The neutral flag covers the enemy's merchandise, with the exception of contraband of war.
(3) Neutral merchandise, with the exception of contraband of war, is not liable to seizure under an enemy's flag.
(4) Blockades, in order to be binding must be effective.

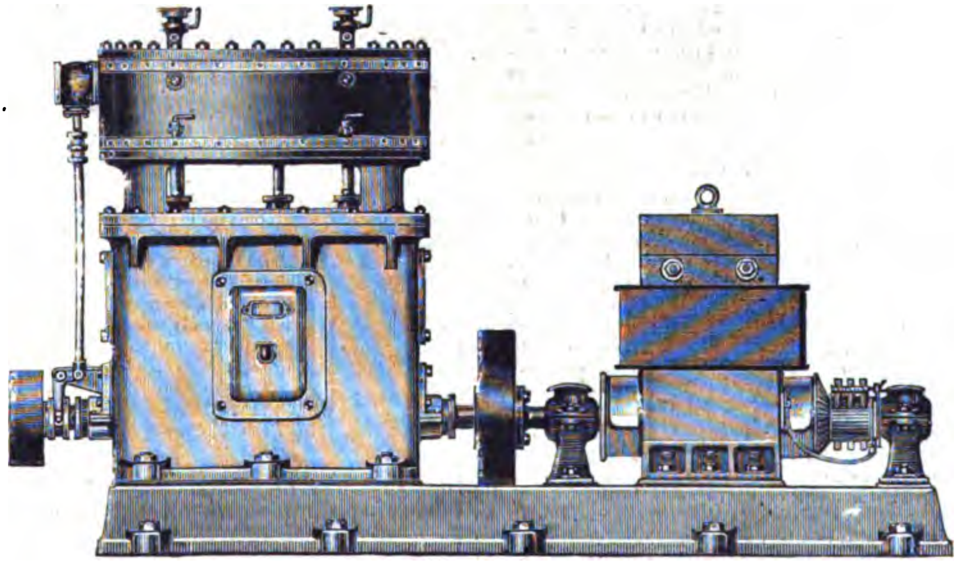


FIG. 3.
THE "RAPIDE" HIGH-SPEED ENGINE. (*See page 57*).

That is to say, a mere paper blockade amounts to nothing.

From this it will be seen that if these combatant Powers were both parties to these Declarations our trade would be little concerned with the war. But, unfortunately, neither the United States nor Spain were signatories. Thus, as far as they are concerned, privateering continues, and they a have further right to search British ships for their enemy's goods. How far the exercise of this right will be insisted upon remains to be seen but it will certainly appear that our trade will be very much interfered with if either government ships or privateers belonging to the combatants can search our ships and take them into their own ports to be adjudicated upon by Prize Courts. The risk, too, of our rights being infringed, and of our being drawn into the conflict, are also very largely increased by such a state of things.

The latest reports, however, seem to indicate that whilst maintaining their rights to employ privateers the United States will so far adopt the principles of the Declaration of Paris as to respect the neutral flag, save where contraband of war is concerned. If that be so the risks of trouble to ourselves will be very greatly minimised. Spain will take the same line on these points. And even the right of privateering seems likely, as far as both combatants are concerned, to remain practically unresorted to.

There is a further matter, too, which now attains prominence for the first time owing to the multiplication of steam vessels and to the disuse of sail power; that is the question of coal. Is it or is it not contraband of war? All must admit that a due supply of coal is of vital importance to the combatants. Our Government has taken a very wise step in declaring that it will consider coal contraband, if supplied for belligerent purposes, and it thus saves us from many possible difficulties.

Plymouth *v.* Southampton.

I had thought at one time that there was some likelihood that Plymouth would prove herself a dangerous rival to Southampton in the mail and passenger business, especially as a port of call. In this column have been noted from time to time the various changes in their arrangements made by the homeward mail steamers. Our most recent notifications were in favour of Plymouth. It would now appear that Plymouth is, for the present at least, out of the running altogether. In the first place, the Castle Line (all of whose outward boats call at Southampton, but whose homeward vessels use the western port) notifies that the mail steamers will in future proceed direct to the Solent and pass Plymouth by. It is said that this is but one of several steps which the company means to take. It seems certain that they will shortly order the intermediate boats to adopt the same practice as that now obtaining for the mail steamers. Then Plymouth will see no Cape boats at all, for the Union Line has for some time deserted their port.

Southampton will, it is believed, score still further in relation to the Castle Line, but this will be at the expense of the Thames. There seems good ground for the belief that Southampton will soon be made the terminus of the line. This will be a very important and valuable increase in the tonnage of the port. It is said that the reason for the move will be the facilities offered at Southampton for boats of the size which this line is now building, and the corresponding want of such facilities in the London Docks. The next point is one against Plymouth generally. The great scheme for the improvement of the mercantile harbour, which was so enthusiastically discussed but a few months ago, seems doomed to failure, and hopes of its realization are being dispelled even as the aerial castles of Bristol melted away. Bristol suffered from the jealousies of the railway companies. Plymouth seems to be troubled by the requirements of the Naval Authorities. The Plymouth Corporation was promoting a Bill in Parliament during the present session for the improvement of the harbour by the expenditure of about £700,000, on what is known as the Cattewater scheme. The Admiralty considered that this scheme as it stood would imperil the value of the place for naval purposes, and proposed alterations which would increase the cost by another £200,000. The result of this move will be the dropping of the Bill.

But from intimations I received many weeks ago it was apparent enough that Plymouth has nothing like the same chances as Southampton in the competition. The Great Western Railway—though it will always give facilities for special trains of great speed and of the finest rolling stock—does not intend to aid Plymouth to the extent which the South Western Railway has helped—and is helping—the Hampshire port. Whatever the Great Western means to do in this direction will be reserved for their great scheme at Weymouth.

The Dutch Mails.

It is with very great pleasure that I announce that on and after the 1st May the Dutch mails—hitherto carried in Dutch steamers by the Zeeland Steamship Company from Queenborough to Flushing—will be borne in British bottoms from Harwich to the Hook of Holland. The Great Eastern Railway has been a long time obtaining this piece of bare justice from the authorities. They have built up a cross-channel service of a character second to none, and they have done so in spite of subsidised opposition, and in the teeth of other difficulties which might well have daunted the most determined. The position they had made for themselves was assured without this. But the fact that their rivals, with their costly paddle-boats, have lost this assistance will really aid the Harwich boats more than will the additional income, welcome as that, of course, is. The Zeeland Company still has the contract for bringing the mails from the continent. But their opposition as against the Great Eastern boats will now sensibly diminish, and I should by no means be surprised to see it gradually withdrawn, though it will not collapse without a struggle, and no doubt strenuous efforts will be made to galvanize the service into life.

The Extinction of the Sailing Ship

seems to be almost a foregone conclusion. Lines like the White Star have, in times past, maintained a sailing fleet, where they have trained the men who shall one day officer their mail steamers. But the White Star sailing fleet is gone, and a new scheme for training officers has had to be substituted. Accordingly, arrangements have now been made whereby a certain number of apprentices shall be carried in the steamers. These will be engaged at a certain salary and no premium will be exacted. From those who have thus served their time the deck officers of the future will be recruited. At present, this line will entirely rely on the cadets of H.M.S. *Conway* for the supply of its apprentices. But it would appear that it will not be able to do so long. For other lines—notably those important organisations directed by the firm of Messrs. Elder, Dempster & Co., of Liverpool—are doing the same thing, and either some new source of supply will have to be tapped or the accommodation of the successful school, now housed aboard H.M.S. *Conway*, will have to be very largely increased.

The Dundalk and Newry Steam Packet Company,

a very old-established line of Channel steamers, is one of the latest to discover that the day of the paddle steamer is over, and that the twin-screw has taken its place. At their recent meeting the chairman made the announcement almost in the terms I have now used. The company is about to add at least one modern vessel of the twin-screw type to its fleet. It may now be truly said that the directors of no important service, except those of the foreign subsidised lines and those of some of the less enlightened railway companies, have now refrained from grasping this sufficiently obvious fact.

A Famous Greyhound.

The *Arizona*, after her long rest and a complete refit, left the Clyde on the 29th March for Cardiff, *en route* for the Northern Pacific, where she will join a number of other old friends in carrying on the mail service between Tacoma and Japanese and Chinese ports. A very great deal has been done to her to adapt her for her new employment. She has been re-engined and reboilered. Her original speed would, of course, have been far in excess of the requirements of the North Pacific trade. Accordingly her power is less than formerly, whilst the improvements in her machinery will tend to very greatly reduce her coal consumption.

The vessel's original speed was 17·3 knots. It is now but 15½ knots. Her intermediate accommodation has been entirely abolished. There is, however, room for a thousand steerage passengers. But the saloon capacity is reduced to the very humble maximum of forty persons, though one may well envy the few who are favoured with passage by her. Deck-houses and such like re-arrangements have brought the gross tonnage up to about 5,500 tons, which is nearly 350 tons more than its original figure. Special steps have been taken to adapt the vessel for the carriage of silk and of tea. Her capacity for the latter commodity is something very high, amounting to upwards of 6000 tons measurement.

Messrs. C. W. Kellock & Co.

are offering her famous companion, the *Alaska*, for sale by auction on the 12th May. The *Alaska* is about four years younger and much larger, faster and more powerful than the *Arizona*. She has not enjoyed so long a rest, for she had a considerable spell of employment under the Spanish flag after Messrs. Guion ceased to run their Atlantic passenger line. Her speed is stated to be about 16½ knots laden on the Atlantic. But of course her consumption with her original compound engines would be higher than the *Arizona's* is now, whilst her deadweight capacity is only about 4,600 tons. But she has accommodation for 100 saloon passengers as well as for the same number of steerage as the *Arizona*.

Messrs. Kellock have a good many interesting steamships on their books at present. They recently disposed of the unfortunate steamship *British Crown*, which had so unpleasant an experience at Las Palmas in November of last year. She was got off, however, brought to Liverpool, and in her damaged state fetched the sum of £16,000.

The "Dahomey,"

which stranded on the rock-bound Welsh coast near the North Stack in a dense fog on the 6th April, has given further proof of the excellent workmanship put into their vessels by Sir Raylton Dixon's firm. The vessel suffered not only from stranding, but also from a long continued fire. Yet she was safely got off by the salvage vessels, *Ranger* and *Hyæna*, assisted by the Liverpool tugs *Wrestler* and *Challenger*, on the 21st. She seemed comparatively little injured by her fifteen days sojourn on the rocks, and after being beached for tightening, was able a couple of days later to venture on the tow to Liverpool. Her owners are to be congratulated on the restoration to their fleet of a fine steamer, not yet seven years old, and her builders on a further proof, if it were needed, that the strength shown by the ill-fated P. & O. s.s. *Aden* is generally characteristic of the Middlesborough shipyard's work.

La Compagnie Generale Transatlantique.

is meeting with some trouble in the French Chamber over the new mail contract. There is opposition to the proposals made for the encouragement of the company's designs for building faster and larger vessels. This opposition seems to arise, not from any idea that the proposed subsidies are too great or from any other economical or unpatriotic motive, but from the old trouble of local jealousies. It originated with those who wish to see the port of departure changed to Cherbourg in the place of Havre. If some arrangement be not come to speedily, the time allowed for getting the new boats to work will have to be extended, and I should imagine the company's remuneration somewhat increased, for the improved service was to be in working order by the time of the Paris Exhibition of 1900. There is little margin of time now, and if, through no fault of theirs, the line loses its share of the expected traffic it will be likely to demand a higher subvention.

Meanwhile it is reported that a large tract of land situate at the mouth of the Gironde has been purchased by M. Pereire, the President of the Transatlantique Company, with a view, it is said, of eventually removing the line's arsenal and ship building works thither from its present site at Penhoet.

Last month I alluded to the company's experiments with carrier pigeons. The birds released by *La Bourgogne* on the first trial did well, arriving home very shortly. Those on the next week's steamer, *La Bretagne* (which left Havre on the 26th March), were carried a little further and did even better, for they were able to give a practical illustration of their value. On the 30th March a derelict and dismasted barque, by name the *Bothnia*, was towed into Falmouth. By the time she arrived there anxiety as to the fate of her crew was to some extent relieved by the report of the steamship *Chollerton*, whose master on arrival at Swansea stated that, when 250 miles south of Scilly, he was boarded by a carrier pigeon sent off by the captain of *La Bretagne* with the information that he had fallen in with the *Bothnia* the morning after his departure from Havre, that three of the barque's crew had been killed by the falling spars and that the remainder were safe aboard the mail steamer *en route* to New York. Thus the news of this incident was received a full week earlier than it could otherwise have been, thanks to the pigeon. Later experiments, however, have not been so encouraging. The weather has been heavier and the distance to be traversed by the birds has been greater and the result has been that hardly any of them have reached land. One of those that did succeed in effecting an arrival managed to get to the wrong side of the Atlantic. That, of course, is not—for the purposes of mercantile work—of very great importance. For so long as news of this kind gets to land at all the cable will soon disseminate it. But the incident seems to be against the employment of the birds for purposes of war—unless indeed the messages were written in a carefully constructed cipher—as there would appear to be no certainty that they will not go over to the enemy and do more harm than good to the senders.

Crossing the Atlantic

has long ceased to be a very formidable or tedious matter, and one has heard of bar-tenders and shipmasters who have made several hundred trips apiece. Yet one cannot but treat the achievement of the anonymous gentleman who is just about to complete his hundredth trip as a passenger with something like respect. He surely holds a unique and, at present, unassailable record. His trips are stated to have been as follows:—

Cambria	1	*Asia*	8
America	2	*Africa*	8
Arabia	1	*Persia*	8
Canada	4	*Scotia*	10

Then, though still true to Cunard's, he took to their screw fleet, and made further trips:—

Australasian	3	*Scythia*	3	*Etruria*	6
Java	6	*Bothnia*	3	*Umbria*	8
China	4	*Servia*	6	*Lucania*	8
Abyssinia	3	*Aurania*	4	*Campania*	2

He has now booked to cross in the *Lucania* again on May 21st, which will "complete his century," as the cricket reporters say.

The Dominion Line

is going ahead very strongly since its new managers assumed the reins. Their experience with the fine liner *Canada* has shown them that it pays to treat the public well. Accordingly they have very much extended their service. An improved *Canada* has been launched from Queen's Island, and will, it is expected, be at work by the end of June. Her name is the *New England*. These two twin-screw vessels will maintain at present a fortnightly service between Liverpool and Boston, and the character of the two ships, which will maintain it, will be such as has hitherto only been offered to the New York passenger. Meanwhile the Canadian branch of the trade has not been neglected. Two new Queen's Island ships, have been acquired for it. One of these is the *Dominion*, formerly one of the Hamburg-American "P's," a fine twin-screw passenger and cargo boat. The other is the *Yorkshire*, a vessel with a good reputation in the Rangoon trade, from which she has just been displaced by the advent to the Bibby Line of the *Derbyshire*. The weekly Liverpool-Montreal service of the Dominion Line will now be maintained by the two vessels just named in conjunction with the steamers *Vancouver*, *Labrador*, and *Scotsman*, which have long been favourably known in the trade. There has, however, been a new departure in the passenger arrangements of the three vessels which join the service for the first time this season, and this should not pass unnoticed. It is the special attention which is to be paid to the steerage passengers. They are to have enclosed state-rooms, containing not more than six, nor less than two, berths apiece. The improvements here offered may be summed up by saying that the steerage passengers by these vessels will have the accommodation which is offered to the third-class passengers—as distinguished from the "emigrants"—in such lines as the Orient to Australia, and the Mail Lines to the Cape.

The Reports

of the 1897 trading of the various steamship companies are coming in thick and fast. The Atlantic lines all report a serious falling off in the numbers of passengers they have carried. The Hamburg-American Company, however, pays a 6 per cent. dividend. It is about to extend its services to the Far East. In this connection it may be noticed that it is working in conjunction with certain other firms, notably the North-German Lloyd Company, the Royden Line of Liverpool, and the Sloman Line of Hamburg.

The North-German Lloyd Company pays 6 per cent. also, which is an increase on its rate of the previous year. It speaks in very satisfactory terms of its new acquisition, the *Kaiser Wilhelm Der Grosse*, and of the re-constitution of its fleet. With all its new tonnage it concludes that it is still under-shipped, and speaks of large additions to its fleet in the near future.

The Cunard dividend of the previous year is maintained, and about 10 per cent. on the capital value of the fleet is written off. It also has a building programme. A large cattle and cargo boat has been bought on the stocks. The vessel, I understand, is being constructed by Messrs. C. S. Swan & Hunter. The line is also inviting tenders for a couple of large vessels. All these will be for the Boston branch of the service. Meanwhile a fourth, *Pavia*, has been ordered from Messrs. Armstrong for the Mediterranean.

The Orient Company also pays 2½ per cent. dividend, and at the same time writes off a sum equal to 6 per cent. on the prime cost of their fleet. They, too, have a steamer building. She will be a twin-screw vessel of upwards of 8,000 tons, but the name she is to bear is not yet made public.

The West India Royal Mail Company is also building three new vessels.

In fact, the shipbuilders of the United Kingdom were never so busy as now. Their business was, of course, at a standstill for the seven months of the disastrous strike. But now they are making up for lost time, and upwards of a million tons are on the stocks, or on order.

The Question as to the Legality of Marriages at Sea

seems at last likely to be raised, if the story printed in the daily papers on Easter Monday, about the wedding on board the West India Royal Mail steamer *Atrato*, be correct. It appears that a young lady from Guildford went out to be married to a lover who resided at Savanilla. Obstacles of a legal and religious nature stood in the way of the performance of the ceremony on shore, and accordingly the parties arranged with the ship-captain and a local missionary to solemnize the marriage at sea, whilst the ship was proceeding to an adjacent port. This was duly done, and the note of the fact entered in the ship's log. It will be interesting to see if its validity be contested as the power of a shipmaster to perform (or to allow to be performed) marriages on his vessel, though very firmly believed in by sailors, is somewhat questioned on land. At all events, the Merchant Shipping Act says nothing on the point except to enjoin that records of all marriages that take place on board must be logged, and that copies of the entries must be transmitted to the proper authorities.

Bilge Keels.

The universal adoption of bilge keels in warships, passenger-steamers and cattle boats causes some interest to attach to a correspondence which has recently taken place in the *Journal of Commerce*. It was stated that the first vessel to be so fitted was the *Ekuro*, a little steamer of 200 tons, sent out to Lagos for work on that unpleasant bar. She was flat bottomed to minimise draught of water, and she rolled so badly that great waste of time and loss of produce ensued. The defect was, however, remedied by taking the vessel to Bonny, beaching her there, and fitting rolling chocks to her. This incident occurred in 1875. But the *Ekuro* was not allowed to retain the honour long without dispute, for another correspondent soon claimed it for the steamer *Jose A. Moreno*, built in 1870 at Dundee, by Messrs. Gourlay Bros., and fitted with bilge-keels at the time of her construction. A third writer, however, mentioned the London and Antwerp steamer *Belgique*, built by Messrs. Scott, Russell & Co. This vessel was built in the fifties, and at first rolled excessively. But the addition of bilge keels cured the defect. The same writer claims that in the previous decade he had seen a paddle steamer in use on the Mersey fitted with bilge keels, and states his belief that even at that time the idea was not a novel one. If he be correct, we may assume that the use of these preventatives is practically as old as steam navigation, and if it be so further discussion is useless and uninteresting.

MACFARLANE & BRYANT'S AUTOMATIC STOP VALVE.

In pursuance of our various articles upon the necessity for the employment of such devices as will prevent or, at any rate, minimize the effect of explosions of steam pipes, we have pleasure in illustrating an automatic stop valve, which may either be fitted on the same spindle and within the same casing as the ordinary screw-down stop valve, or may be attached thereto in a separate casing.

This valve is of the piston equilibrium type, which remains out of action so long as the pressure of steam on the supply and exit side of the valve remains practically the same, but so soon as the pressure in the pipe falls abnormally by a sudden rupture, the unbalanced pressure on the bottom of the piston valve causes it instantly to close automatically and stop the issue of steam. At the same time this valve fulfils the requirements of a non-return valve, by which, should one boiler of a series explode, the reverse stream of steam from the other connected boilers would close the upper part of the piston valve and thus isolate the damaged boiler.

Fig. 1 of our illustration gives a section of the valve with the automatic valve open and the steam passing in normal manner, whilst Fig. 2 shows the automatic valve closed by a too sudden rush of steam consequent upon a lowering of the pressure in the outer steam pipes from any abnormal cause, such as a bursting fracture.

As will be seen, the main part of the automatic valve, fitted as an easy fit in the stepped neck of the casing above the ordinary screw-down stop valve, is an annular piston of two different diameters, and with the lower and upper annular areas arranged so as to make the piston in balanced equilibrium when the pressure above and below the piston are alike, and by variation of the respective annular areas the piston valve can be made to shut with any loss of pressure.

The piston has a central grid opening, over which there is a mushroom valve moving freely, upon a sleeve surrounding the spindle of the ordinary stop valve, and making a joint when down upon the inner and outer rims of the central grid opening. The said sleeve having a collar below the piston is connected to a hand lever fulchrumed upon the fixed frame-work of the valve casing as a test handle by which the freedom of movement of the piston can always be ascertained.

When the steam is passing normally from the boiler to the engine the flow of steam passes through the central grid opening of the piston and suspends the mushroom valve above it in an open condition, and at the same time maintains an equilibrium of pressure upon the upper and lower faces of the annular piston, which thus remains at rest in its lowest position, as shown in Fig. 1. Upon an explosion taking place the pressure above the annular face of the piston is relieved, and the unbalanced pressure on the lower face suddenly lifts the annular piston, driving it up against the face of the mushroom valve, which is held up against the end of the stuffing-box, and the steam is thus suddenly shut off, as in Fig. 2.

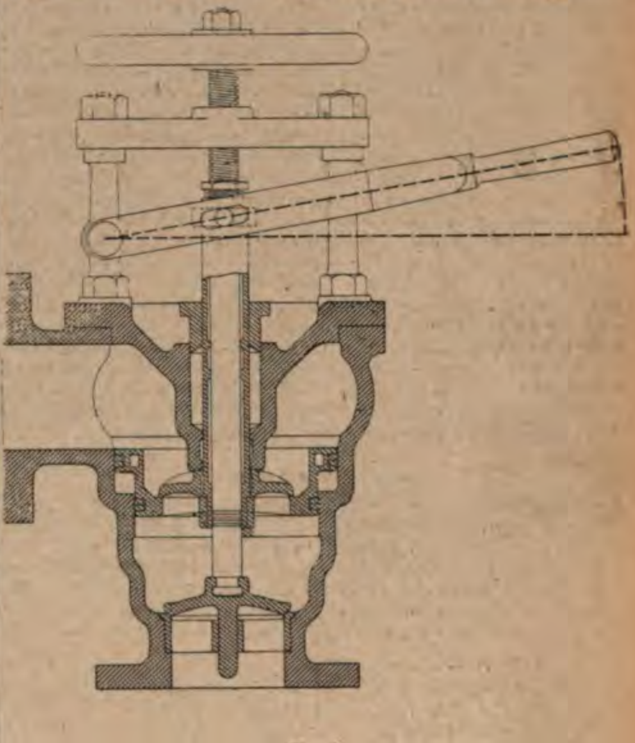


Fig 1.

The piston makes an easy sliding steam-tight joint in its casing by two Ramsbottom rings, slipped into suitable recesses in the upper and lower bodies of the piston, as in locomotive pistons.

Should one of a series of boilers explode the steam derived from other connected boilers reverses the direction of the flow through this valve, and the upper mushroom valve thus closes down at once upon its seatings about the grid opening in the piston, and thus acts as an instantaneous non-return valve.

These valves are manufactured by Messrs. A. T. Macfarlane & Co., of Glasgow, and from a paper we have before us, describing the dangers and causes of explosions in steam-pipes, read by Mr. A. T.

Macfarlane before the Royal Scottish Society of Arts, we are glad to see that in many ways his views therein expressed are identical with our own. This society have awarded to Messrs. Macfarlane their Keith prize and silver medal "In recognition of improvements on steam valves as life-saving appliances."

It would appear that in many cases such accidents can be traced to carelessness in opening the valves attached to pipes, sufficient precaution not having been taken as to the expansion of pipes, or as to the formation or presence of large bodies of water from the condensation of the steam, which, being set in violent motion, produce blows and shocks enormously in excess of the ordinary static steam pressure, and thus produce rupture.

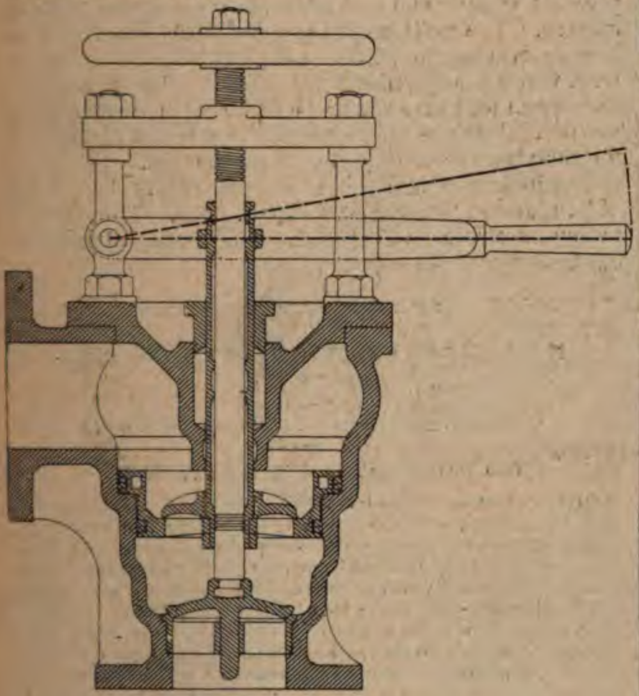


FIG. 2.

As a protection against such carelessness Mr. Macfarlane claims that upon too sudden opening of the screw-down valve the pressure below the automatic valve being in excess, it will close automatically, and cannot be re-opened until the screw-down valve be closed, and proper gradual percolation of the steam be admitted. The valve thus also acts as a protection against careless handling, in opening so that an attendant will perforce have to adopt the desired mode of gradual warming and admission of steam, which it is believed would prevent many disastrous explosions.

The effect of the forces acting on such a valve as the automatic valve we have described, is readily apparent as assuming a loss of say 30 lbs. pressure, due to the rupture of the pipe between the pressure in the steam pipe and boiler, at a working pressure of say 150 lbs. per square inch. Under these circumstances, the closing pressure on an ordinary sized valve would be about 1,200 lbs., which is obviously more than enough to smartly close the valve; but by variations of the respective annular areas of the piston valve, the valve can be made to act promptly at much smaller differences of pressure. We understand the valve works so quickly that there is no danger even in standing immediately in the neighbourhood of a damaged pipe, and that Messrs. Macfarlane are prepared to demonstrate this to anyone desirous of investigating this point, and seeing the action of these valves under steam.

THE NEW SHEER-LEGS AT HAULBOWLINE.

ON March 14th these sheers were most successfully tested in the presence of a number of gentlemen. They were put through a very thorough test. In the first instance each of the hoisting winches were worked separately with a load of 50 tons, with the sheers in extreme positions; secondly, the full test weight of 90 tons was lifted with the winches coupled, the sheers being traversed at the same time. All these trials gave complete satisfaction, and it was remarked with what ease the back leg was brought in from an extreme overhang of 50 ft. with the full load suspended. The sheers and machinery were made by Messrs. Day, Summers & Co., engineers and shipbuilders, of Northam Iron Works, Southampton, who have efficiently carried out the erection of the same at Haulbowline, under the superintendence of Mr. C. H. A. Day. The sheer-legs are constructed of mild steel plates, the front legs being 120 ft. long and the back one 150 ft.: they have an overhang of 50 ft. and an inhang of 19 ft. The back leg is traversed in and out by a forged steel screw of 9½ in. diameter, which is worked by a pair of horizontal engines with two cylinders. A powerful brake and automatic gear for effectually stopping the engine, when the back leg is at its extreme position, is also fitted. There are two hoisting winches, each capable of lifting 50 tons, and they are driven by a pair of engines working a worm and worm-wheel; provision has also been made for coupling the two together for lifting heavy weights.

METALLIC REFLECTORS.

METALLIC Reflectors for search lights and similar purposes are not at present generally used, owing to the difficulty in the production of such a surface of true geometrical shape by spinning or other cheap methods, the cost of grinding and polishing a solid and stiff metal surface being excessive, and the surface so obtained even then is unsatisfactory. And yet a metallic reflecting surface has distinct advantages photometrically above a glass mirror, as from the metal the reflection is absolute from the external surface, whereas in glass the light has to pass and return through a perceptible thickness of glass with catadioptric effects.

Mr. Sherrard Cowper-Coles, A.M.Inst.C.E., claims to have discovered a new process that perfectly solves the question of a cheap mode of preparing a true metallic reflector, which he protects also from after-tarnishing when exposed to the heat of an arc light.

His process is as follows:—A glass convex mould is prepared of which the convex side is accurately shaped, and polished to form a true parabolic or other reflecting surface. As the mould only requires shaping and polishing on the convex side, it is cheaper than the preparation of a glass reflector, which has to be ground and polished on both sides.

When also the glass mould has been once produced, it serves for any number of metallic reflectors, which are produced therefrom with absolute truth of surface, without further touching or polishing.

This is done, by Mr. Cowper-Coles, by depositing electrolytically a coating of metallic silver upon the glass mould, the concave surface of the reflector being an exact reproduction of the glass mould, and having internally the same brilliant polish.

To properly support this thin metallic coating of silver before removal, a fairly thick coating of copper is electrolytically deposited as a backing over the silver. To secure perfect adherence between the copper and the silver the back of the silver coating is first polished.

The mould and silver coating is suspended in a suitable frame and rotated at about 15 revolutions per minute in an electrolyte of copper sulphate, with the necessary electrical connections. The copper adheres firmly to the silver and may be deposited to such a thickness that the reflector can be easily handled and set as required in the search light mechanism, or for any desired purpose without liability to deformation.

To remove the backed reflector from the mould the whole is placed in cold or lukewarm water, and the temperature of the water is raised to 120° F., when the reflector detaches itself from the mould by the unequal expansion of the reflector and the mould.

The reflector is then in a brilliantly polished condition on its inside surface and is ready for use, but it has been found advantageous to coat the reflecting surface with palladium in a very thin film to prevent tarnishing under the heat of the arc light. This it is found to do in an eminent degree.

Mr. Cowper-Coles is already well known to us as a successful and energetic inventor in electro-chemical and metallurgical research, and we think the practical results of his process for the production of metallic reflectors is likely to be a great boon to those using search lights.

It is obvious that a reflector that will not smash to pieces under the impact of a bullet, as glass would, will be of immense advantage in the Navy, in the case of search light and flash signal reflectors that are subject to all the dangers of warfare.

MILLING MACHINES.

WE illustrate in the adjoining diagrams two designs of milling machines which are manufactured by the Britannia Co., of Colchester, whose London show-rooms are at 100 and 101, Houndsditch. Fig. 1 of the diagrams shows a very handy and compact vertical milling machine with double gearing. It has a strong box-pattern body and is fitted with a steel spindle revolving in conical bearings, and having a thrust bearing at the top capable of adjustment to take up wear. The work table is provided with planed T slots for fixing the work, and is fitted with a trough to catch the soap and water.

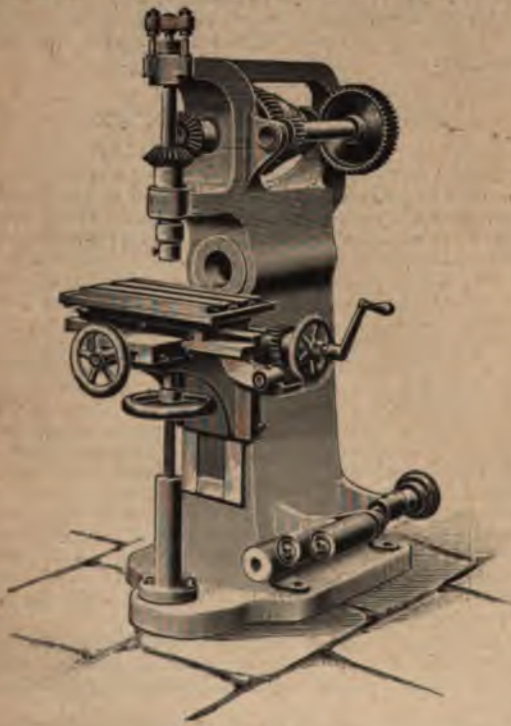


Fig. 1.

The longitudinal, transverse, and vertical slides are each adjusted by conveniently placed hand-wheels, the longitudinal slides being fitted with a self-acting feed traverse. This self-act feed is operated by a set of three speed cone pulleys and worm gearing. The working table is 24 in. long and 8½ in. wide, and is capable of 7½ in. transverse, 18 in. longitudinal and 14 in. vertical traverse. The main spindle is 1⅝ in. diameter, and is fitted with four speed cone pulleys and with gearing of about 9 to 1.

Fig. 2 is a view of a single-geared double-ended milling machine of very rigid construction. It has a box section head mounted on two legs, carrying the headstock in the centre, having a spindle which projects at each end and adapted to carry the milling cutters. The machine is provided with two saddles, having transverse slides and gripping arrangements with vertical adjustment for work. The transverse eed worm and screw-gear is fitted with disengaging motion. Bearings are provided at each end of the bed for carrying the ends of the cutter spindle.

The height of centre is 16 in., the bed is 6 ft. long. 13¼ in. across the face and 13¼ in. deep. The driving pulley is 20 in. diameter and the cutter spindle is 3⅞ diameter in the body.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

Our New Naval Base in the Far East.

THE acquisition of Wei-hai-Wei by the Government appears to have met with a good deal of satisfaction in naval circles, despite what the papers say regarding its uselessness as a naval base. It will not be fortified at present, but the fact that when it is formally handed over to us we shall use it as a repairing base for our warships means that a fairly large staff of engineers and machinists will be needed out there, and that some good billets will be open to those who care to go out to such a place. The official reason for securing the lease of the place is to have a naval base in northern China, but it is really an intimation to Russia that Great Britain has no intention of allowing her trade in Manchuria to be taken away, nor to allow Russia to convert the Gulf of Pechili into a Russian lake. It is undoubtedly inferior to Port Arthur as a coaling station, and the anchorage for ships of great draught is limited; but, nevertheless, it will afford good shelter for a number of our men-of-war in that part of the world, and considering how the China squadron is continually increasing, such a place was wanted. Much engineering skill will be found necessary before the place is made as strong as could be wished for. Of docks there are none, and if we intend to stay there permanently, as doubtless do the Russians at Port Arthur and the Germans at Kiaou Chiau, a great deal will have to be done and money spent freely. Wei-hai-Wei is said to be a circular bay, backed by hills between 500 and 2,000 ft. high. These were crowned with twelve batteries of modern type at the time of the China-Japanese war. The entrance to the bay is protected by two islands, both fortified, but whether the defences are in good condition or not we cannot say. Anyway, it is well that we have checkmated Russia and Germany to a certain extent.

Free Coal for the Navy.

The patriotic offer which Durban has made to the home Government to supply our warships with a certain amount of coal yearly, shows that this colony does not mean to be outdone by Cape Colony, Canada, or the rest, in patriotism. The offer has been accepted in the spirit in which it was made and every Britisher should feel proud of the fact that those other Englands across the salt seas are inspired with such love of the mother country, a fact which we are afraid France, Germany, or any other European nation, cannot boast of. The actual offer was made in the form of a telegram from the officer administering the Government of Natal. It ran as follows:—

"30th March. I have received following minute from Ministers:—'Ministers have the honour to request His Excellency to telegraph to Secretary of State for Colonies informing him that Government Natal is prepared to supply free of cost twelve thousand tons of steam coal annually to ships of Her Majesty's Navy calling at port of Durban. Ministers also desire to state that all possible facilities will be afforded to any of Her Majesty's ships so calling.'"

Two days later Mr. Chamberlain telegraphed his reply. It ran:—

"In answer to your telegram of March 30th, inform your Ministers that Her Majesty's Government are very much gratified with the generous offer of the Natal Government, and highly appreciate the spirit which has dictated it. The Lords Commissioners of the Admiralty will be glad to avail themselves of the offer as far as possible."

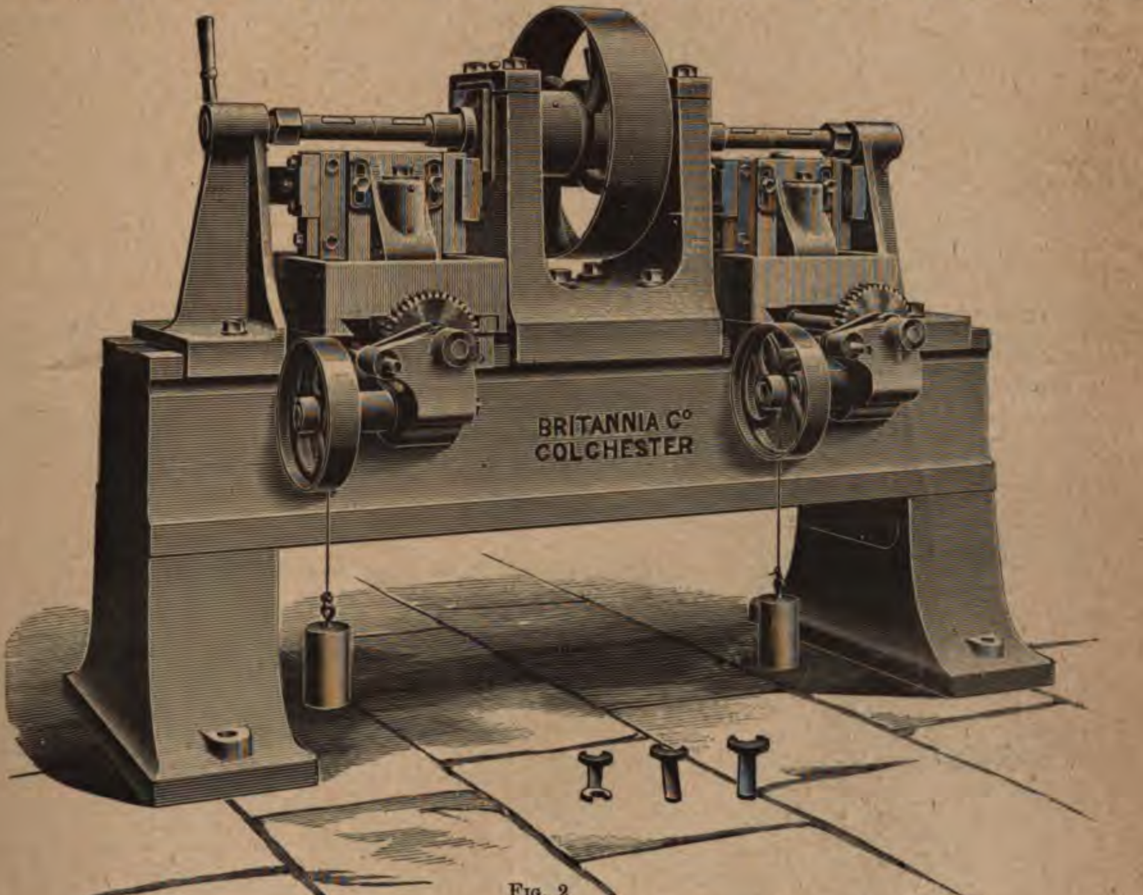


Fig. 2.

Single-Geared Double-Ended Milling Machine.—(*See page* 64.)

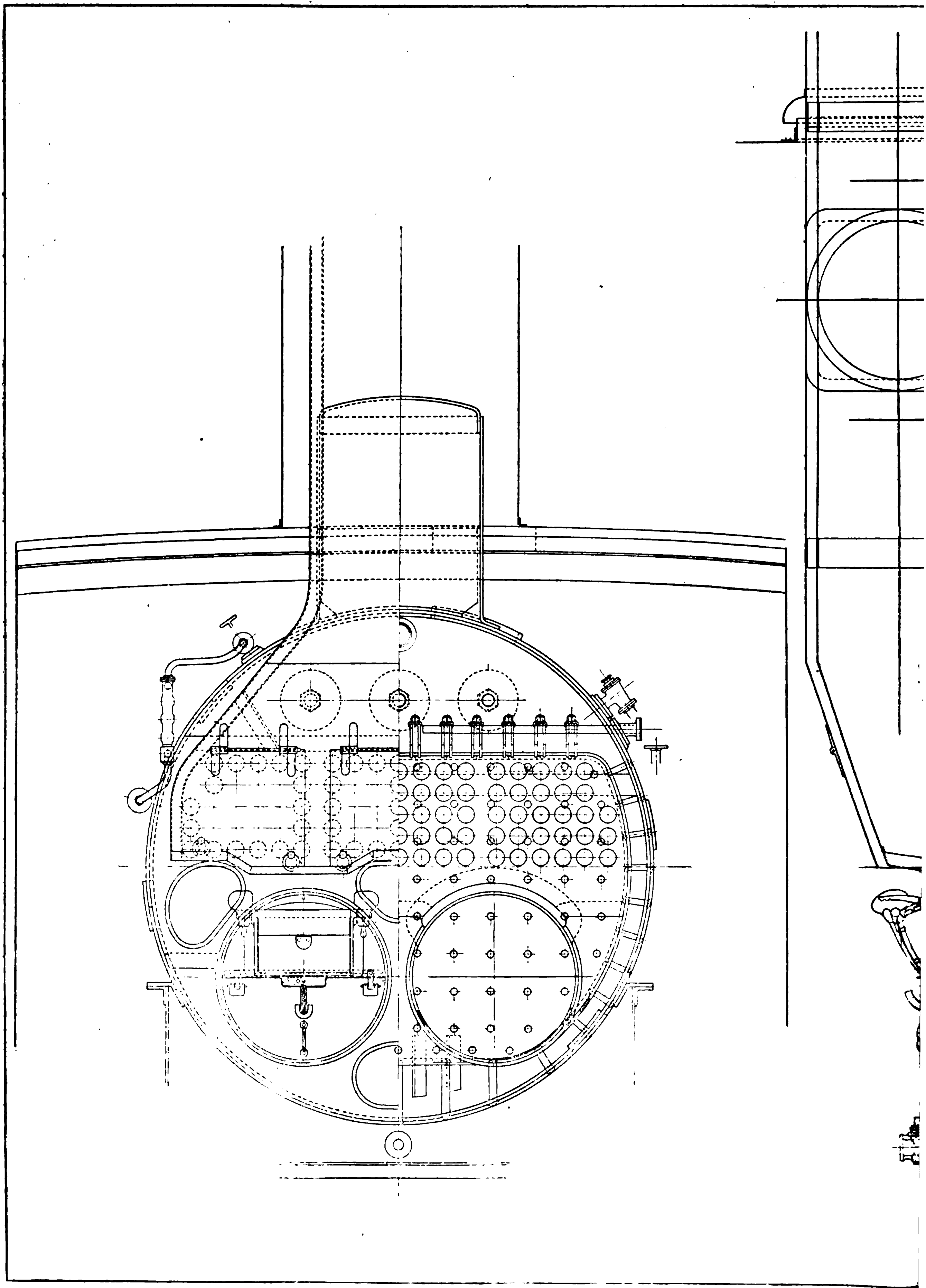
The amount of coal placed at our disposal represents a good deal over £12,000, as warships at Durban have to pay, more often than not, nearer thirty shillings than twenty for each ton of coal taken on board.

Portsmouth Dockyard.

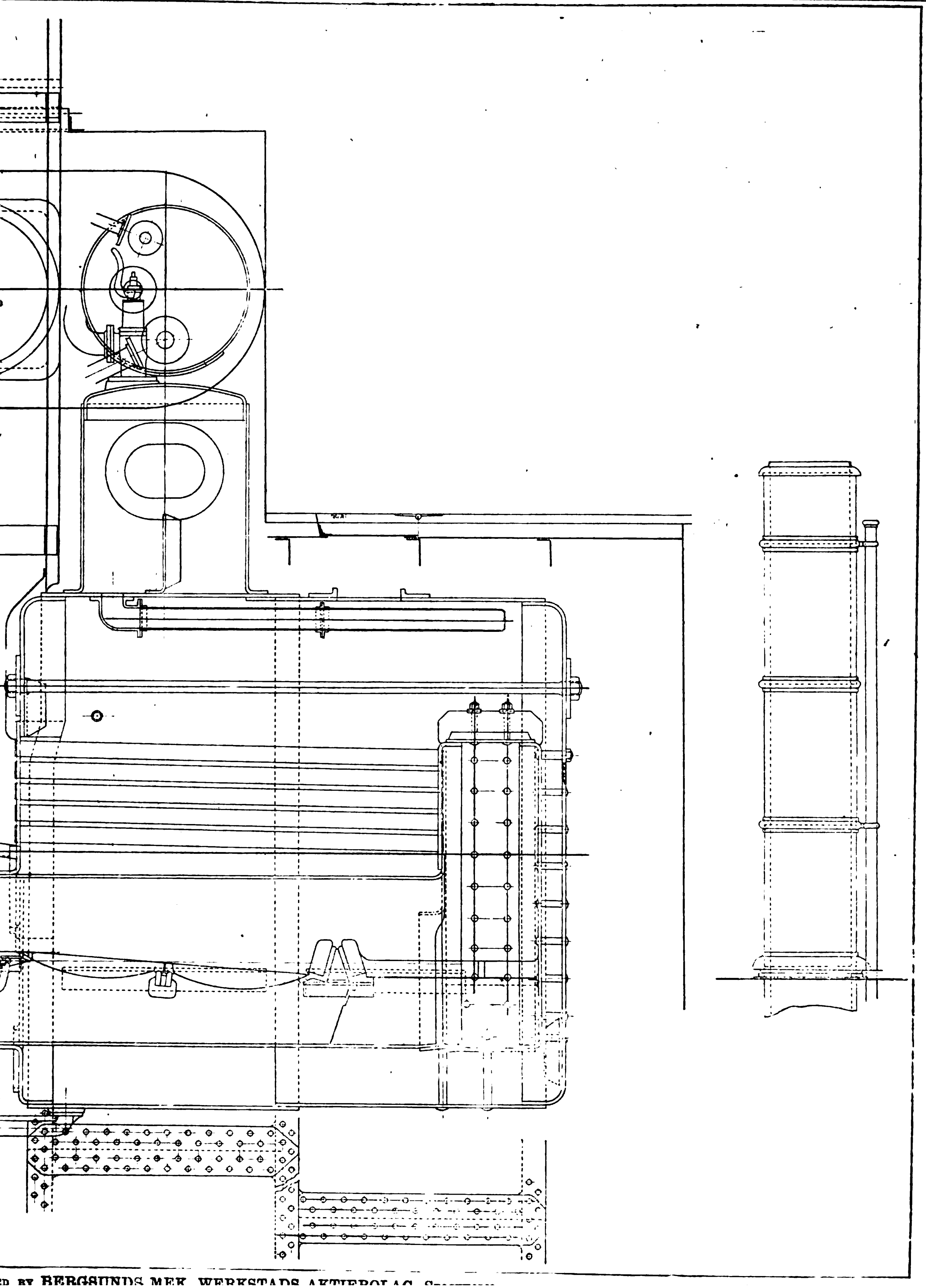
The war scare which has run through Europe has not apparently resulted in making this yard any the easier, but there is plenty of work going on and to spare. Interest centres of course in the progress of the *Formidable*, and to see her on the blocks at the present moment one would suppose she had been commenced months ago instead of weeks. Hundreds of tons of material are waiting ready to be built into her and if she progresses all through her building stage as she is doing at present she will be a record ship. Much will of course depend upon the delivery of the principal castings. The date of the launch is already talked about, so very rapid has been her progress. The farce which takes place yearly of dismissing and re-engaging hired men was gone through at the beginning of the month, as was that of extinguishing all fires on Fleet Reserve ships. The agitation among the rivetters has now completely subsided. The fact that the men have been earning lately nearly double their ordinary pay has had a good deal to do with this. The members of the Navy League are to visit this yard some time next month, and, as it is two years since they paid a visit here, they will have an opportunity of seeing the tremendous progress which has taken place everywhere since that time. It is hoped that by the end of next month she will have all her armour on. When the League made their last visit the ship was hardly thought of. There are many things they will see that will considerably open their eyes. The accident to the training brig *Wanderer* happily resulted in little damage. It appears that as she was leaving Portsmouth harbour a cross current carried her ashore. Tugs were promptly sent to her assistance and she was towed off without having sustained any serious injury. On the second of this month the *Hannibal* is to pass out of the dockyard hands into the Fleet Reserve. The *Europa* is being completed for sea at this yard.

New Warships.

The keel of the new battleship *Irresistible* has at last been laid at Chatham, although work in connection with the vessel had been going on for some time beforehand. The keel has been laid on the slip which the *Goliath* has recently vacated and during the current financial year it is proposed to spend £417,000 upon the vessel. Her dimensions are:—Length, 400 ft.; breadth, 75 ft.; mean load draught, 26 ft. 9 in. At load draught her displacement works out at 15,000 tons. She will practically be an improved *Majestic*. Her engines are to give 15,000 I.H.P.



BOILERS OF THE DOUBLE-SCREW FERRY STEAMER "BELL BROOK"



ED BY BERGSUNDS MEK. WERKSTADS AKTIEBOLAG, S with a speed of eighteen knots, a knot better than the *Majestic*. She is to be heavily armoured, although of course the recent improvements in the making of armour plates would naturally give her somewhat of an advantage in this respect. Her armament will consist of four 12-in. breech-loading guns, twelve 6-in. quick-firing guns and thirty smaller quick firers. The first-class cruiser *Niobe*, now being constructed at Barrow, will be sent to Devonport to be completed for sea, when ready to leave the builders' hands. She is of slightly less tonnage and H.P. than the *Powerful*. Her total cost is reckoned at about £580,000 and some £90,000 of this will be spent upon her when she reaches Devonport. Messrs. Laird Bros. are to build the machinery for the new battleship *Implacable*, the Admiralty having finally accepted their tender. The vessel is shortly to be laid down at Devonport. The engines are to be triple-expansion and are to develop 15,000 H.P. They are to be worked by twenty Belleville water-tube boilers. The machinery is estimated to cost over £120,000.

Chatham Dockyard.

There is enough work and to spare here, and the financial year which has just commenced may be expected to be as busy as that just closed. The programme of work is a large one. The *Irresistible* is to be ready for launching by the latter end of the year, and another battleship is to be commenced. The battleship *Goliath*, recently launched, and the second-class cruiser *Vindictive*, are to be completed, as is the *Pioneer* when she is launched. A cruiser of a similar class to this one is to be commenced. The refit and repairing programme is also an extensive one. The battleship *Anson* is to have £8,000 spent on her, the *Dreadnought* £30,000, the *Brisk* and *Cossack* £14,000 and £6,700 on the *Astrea* and *Forte*. Of the work now in hand the heaviest parts of the *Goliath's* machinery is now on board, and a large number of her armour plates have been received, and presently she will have her bilge keels fitted and sides pierced for her submarine torpedo tubes. The *Galatea* is to have her annual refit here. The outcome of the recent agitation on behalf of the drillers and rivetters has been that the Admiralty has instituted a new scheme of prices for this work. The scheme is to be given a month's trial on the *Irresistible*. The *Anson* is to undergo a thorough refit here. The *Repulse* will take her place on the Mediterranean station, and the *Illustrious* take the place of the *Repulse* in the Channel Squadron. The paying-off trials of the gunboat *Dryad*, which has recently returned from a three years' commission in the Mediterranean, passed off satisfactorily. She is to be refitted at an early date for another term of foreign service.

The Launch of the "Hermes."

The second-class protected cruiser *Hermes*, which was launched from the yard of the Fairfield Co., Glasgow, at the beginning of last month, is one of the improved *Juno* class of vessels, and is one of three ordered in December, 1896, by the Admiralty to be built in private yards. Her dimensions are :—Length, between perpendiculars, 350 ft.; extreme breadth, 54 ft.; displacement, 5,000 tons. As required by the Admiralty, the hull is composed of Siemen's-Martin steel. Protection is afforded by a curved deck extending from stem to stern, 3 in. thick in its widest part and 1½ in. in its narrowest. This deck covers the whole of the propelling and steering machinery, boilers, magazines, etc. The reserve bunkers are on the protective deck, over the machinery space, and whilst affording a waterline belt of coal protection, additional security is given, in the event of damage, by their being subdivided into watertight compartments. Forward there is an armoured conning-tower made of Harveyed steel, in which the commander will navigate and direct operations in action. The *Hermes'* coal capacity is normally 550 tons, but more can be carried if necessary. Her armament will consist of eleven 6-inch, eight 12-pounder quick-firers, and a number of small machine guns. Forward are two submerged torpedo tubes from which the latest pattern of torpedoes can be fired. The new vessel is fitted with three funnels and two masts. The *Ariadne*, cruiser has also been floated out on the Clyde.

Seamen as Commissionaires.

It has been long thought by many that the corps of Commissionaires was a body whose ranks were recruited wholly from discharged soldiers, but the fact has now been made clear that such is not the case, and that the Corps is open to discharged good conduct seamen as much as to soldiers. Every sailor and soldier, provided his discharge is satisfactory, can apply direct for enrolment without the intervention of anyone. Sir E. Walter, the founder of the corps, says he has been frequently told by naval officers that they had no idea the corps admitted sailors, and this perhaps accounts for the fact that though the officers of the Army during the last thirty-five years have contributed £20,000 to the Officers' Endowment Fund of the corps, those from the naval branches have not given £500, though their disabled men form a large portion of their wounded division. The fact is, goes on Sir E. Walter, sailors, either from the necessities of their profession, or, perhaps, from antiquated customs, were too much boxed up inside their ships, and although they travel a good deal about the world, they only see the outside of it, and when they come home they are too apt to keep to the naval ports and consequently do not know what is going on in the real world; but besides this they can all remain for pension, and having learned a trade, have not the same reason for becoming a commissionaire as a soldier has, though, if disabled, they are very glad to join our ranks. Sir E. Walter is right in this, to a certain extent, and it is hoped that the fact that discharged seamen can look forward to joining such a corps will assist in bringing up recruits in sufficient numbers. The corps we presume is open to the engine-room complement and this should especially be pointed out to stoker recruits.

Devonport Dockyard.

There is an abundance of work at this yard and overtime is once again in full swing, and as far as can be gathered is likely to continue. As a matter of fact the place was so overstocked with work that a good deal of it has been redistributed to other yards, work representing £16,000, as it was found impossible to cope with the refitting programme given out. The *Furious* has been vigorously pushed forward and if possible she will be added to the Channel Fleet after the mobilisation. Had there been no engineering strike she would have been finished last October and ready for the pennant by this time. The Training Squadron is to be reconstituted this month when the *Raleigh* will take the place of the *Active*, which has served as the Commodore's ship ever since the Training Squadron was constituted in 1885. Commodore Poe and the crew of the *Active* will be transferred to the *Raleigh*. The work of patching up the boilers of the *Thrasher* is now almost completed. Considering the way the boilers were damaged it would perhaps have been better to put in new ones. Immediately on the arrival of the *Locust*, *Wolf*, *Gipsy*, *Osprey* and *Fairy* from the contractors they are to be prepared for commissioning. The *Seal* has arrived here to augment the Devonport flotilla. Progress on the *Psyche* was not very rapid until a week or two ago, and in fact not more than 700 tons of material have been built into her since she was commenced five and a half months ago. She was expected to be launched about the end of this month. The rapid work on the *Ocean* and the preparations for commencing the *Implacable* have had a lot to do with this for hands have been drawn from the *Psyche* whenever they were wanted elsewhere. As soon as the slip on which the *Ocean* rests has been lengthened and deepened, which will be in about two weeks time, a date will be set for her launch. The dispute in the South Wales colliery trade has affected this yard somewhat, for the Admiralty have decreed that only North Country coal is to be used in the yard and all Welsh coal to be reserved for ships in commission.

A New Torpedo Net.

The torpedo net defence, which was tried on the *Hannibal* at Portsmouth some few weeks ago, has proved successful, so much so indeed that the battleships of the Channel Squadron are to be fitted with the new system. The mesh of the nets is said to be smaller than was the case in the earlier specimens in use in the Navy, and yet the rings are of sufficient thickness to render the net cutter, now fitted to the heads of most torpedoes, harmless. The new cruisers *Diadem* and *Europa* are also to be fitted with the new net defence.

It may be that during the operations of war now taking place on the other side of the Atlantic, some useful lessons will be learnt in connection with this very subject of protection from torpedoes. The blockading squadron of the United States will be liable to torpedo-boat attack from the innumerable harbours and inlets dotted around the coast of Cuba, and although it is not likely that their vessels will use net defences at sea, it is conceivable that they may find them valuable in certain circumstances. It can be well imagined, for example, that during coaling operations, or when visiting port for necessary repairs, a ship may desire to additionally protect herself in this manner. At all events we may look for experience of this description.

The New Artificer Engineers.

It is not yet known on what description of service the newly created artificer engineers will be employed. They have been sent to the naval depots for disposal, but at present no further steps have been taken in the matter. It is generally supposed that they will fill the places of assistant-engineers in large, or even those of engineers in small ships, under a chief. This would place at the disposal of the Admiralty numbers of experienced officers who could be better utilised in our large modern battleships than in the vessels to which they are now attached. In creating this new class of officers the Admiralty have received commendation all round. There can be no doubt that whether regarded from the standpoint of the engineer corps of the Navy, or from the point of view of the men on the lower deck, the new departure must be considered beneficial. To the first named it will mean that they will be relieved of that part of their duty which will enable them to devote more attention to the higher qualifications of their profession. The men of the lower deck will see in it further opportunities for advancement and a reward for good service which cannot fail to render this branch of the service more popular.

Sheerness Dockyard.

The programme for the financial year which has just commenced is considered by all here to be a good one, the new Estimates allowing for £136,762 to be spent in wages. In the repairing programme the *Buzzard* is one of the principal items, as over £14,000 is to be spent upon her. The *Comus* has paid off and is to undergo an extensive refit. She has been associated with this yard all through her career, and has previously undergone two extensive refits here. Considerable interest has been shown in the trials of the *Proserpine's* machinery, which was made and fitted by Government dockyard employés. The *Dolphin*, sloop, has at last been completed and passed into the Medway Fleet Reserve for commission. She has had her machinery removed and has been fitted out as a sailing ship for the training of boys, to take the place of the *Sealark*, which has been sold out of the service. The *Condor* and *Rosario* proceed apace. The two sloops, which are to be built by private firms, are to be of the same type as these vessels. They will be 180 ft. long, and will displace 960 tons. They will be armed with 6 4-in. and four 3-pounders, with a speed of 13½ knots.

Pembroke Dockyard.

The three ships building here continue to make good progress. The Royal yacht has been pushed forward in a wonderful manner, and her present advanced state gives pleasure to all concerned. The frames and beams in the fore body are in place, as are some of the decks and bulkheads and a good deal of the bottom plating. The *Andromeda* has her masts, riggings, funnels, davits, bridges, and most of her upper deck fittings in position and is altogether growing rapidly. Work in the interior of the vessel is also well advanced. The *Spartiate* is growing rapidly. For about two-thirds of her length she is entirely encased in armour and nearly completed. It is calculated that the ship will be launched in September.

The Building of Warships for Foreign Governments.

Much has been said lately concerning the buying and attempted buying of warships building in Great Britain for foreign Governments by Spain and America. America has succeeded to a certain extent, but Spain's success in this direction has been small. There are said to be twenty-eight warships now building in this country for foreign Governments, and at present we have no power to compel the builders to sell one of them to us in case of emergency, however much we were in need of them. Mr. Balfour seems to have a good deal of confidence in the patriotism of the various private firms. Mr. Arnold Foster, in the House of Commons recently, asked the First Lord of the Treasury if he would introduce a Bill giving the Government power to exercise the option of purchase in the case of any warship constructed in the United Kingdom. Mr. Balfour replied that the Government had no reason to believe that any English firm would refuse to give the Government such option. A northern daily paper has made inquiries into the subject, and according to it, the Government at present cannot do anything of the sort. Armstrong, Whitworth & Co. are said to have expressed the opinion that as soon as the first instalment was paid on a warship in hand she was regarded as the property of the Government for which she was being built, and then any other Power wishing to purchase the vessel must negotiate with the country owning it. Other builders have expressed the same views. It is a matter for consideration whether it would be advisable to pass such a measure as Mr. Arnold Foster asked for, and whether it would affect the shipbuilding industry at all.

Our Naval Bases.

An extremely interesting correspondence has been going on in the *Times* on the subject of naval bases, which are defined as follows:—

"(1) Primary bases, equipped with all the resources of a great naval Power, and, therefore, in the highest sense self-sufficient, though they can rarely be established at any great distance from the mother country.

"(2) Secondary bases not entirely self-sufficient, but approaching that condition in proportion either to the extent of their indigenous resources, whether of labour, material, or skill, or to security of maritime communication and to the efforts made by the mother country to equip, supply, and maintain them.

"(3) Improvised bases in close touch with the mobile fleet and depending mainly, if not wholly, on mobile sources of supply."

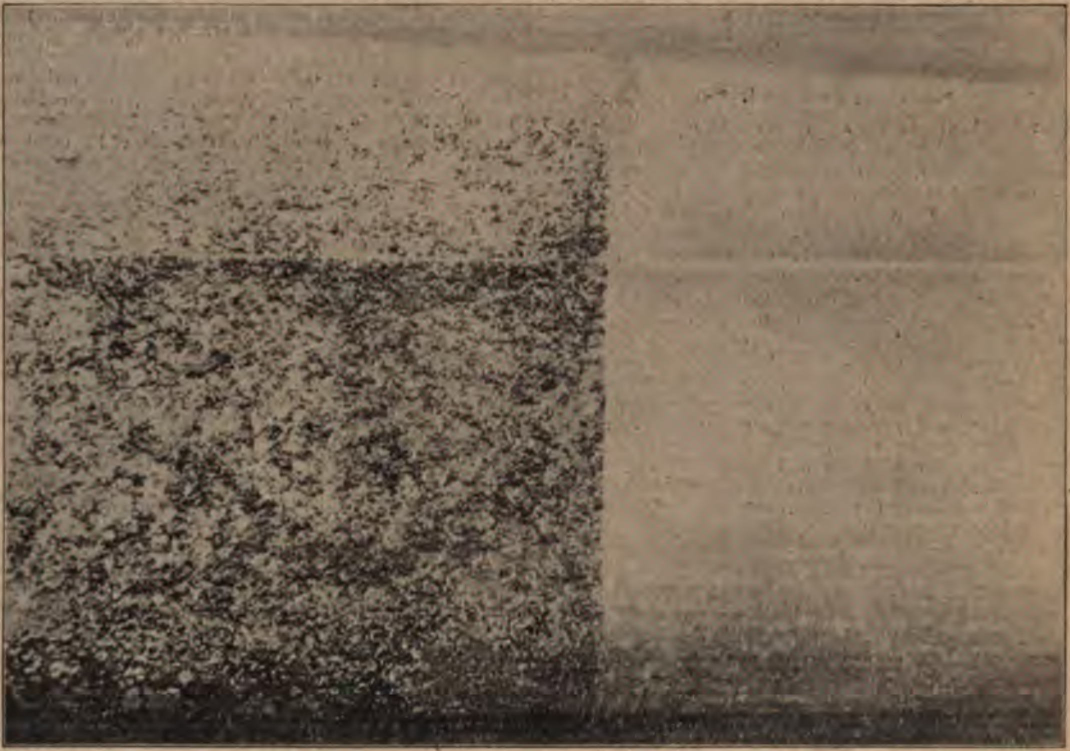
Portsmouth, Devonport, Chatham, are included in the first category with Halifax, Simons Town, Esquimault, and Sydney in the second. The third are mere temporary bases which might be made use of in time of war. They are situated near the field of operations in order that the fleet keeping the sea may repair there for coal, ammunition, and other stores, and effect what repairs are possible with the limited resources at disposal. "There is another class of positions," says one of the writers, "which represents points of strategic movement, and are thereby invested with a somewhat more permanent character than an improvised base pure and simple. Their function as bases is intermediate between that of such a permanent secondary base as Hong Kong, and that of such an improvised base as Nelson, established at the Maddalena. Such a position in the China seas is Wei-hai-Wei, because its relation to Port Arthur designates it as a position of observation and mobile supply most essential to the commander of a British fleet in any war between England and Russia. Lying outside Port Arthur, and practically between it and the outer seas, it is, in the hands of a superior naval Power, a far more advantageous position than Port Arthur itself, for all the higher purposes of naval warfare. An admiral desiring to blockade Port Arthur, that is, to make certain that a fleet sheltering there cannot leave without his knowledge, could desire no more commanding position than Wei-hai-Wei, where in smooth water he can coal and supply his fleet from colliers and shore ships and yet be at all times ready to put to sea the moment he learns that the enemy has quitted his port. A superior mobile fleet resting on Wei-hai-Wei and occupying the channel between the Shantung Promontory and the western coast of Corea is a pistol levelled at the head of an inferior fleet sheltering at Port Arthur, the latter can only reach the outer sea by fighting and defeating its superior adversary." It is generally agreed by the writers that the fortification of Wei-hai-Wei is unnecessary, and one of them suggests that if the changed strategic situation in the neighbourhood of the Gulf of Pechili requires us to create a permanent secondary base further north than Hong Kong, Chusan would seem to be indicated by the strategic military and commercial situations as better situated than Wei-hai-Wei, and being an island not commanded from the mainland it is capable of more effective defence by a power whose strength is and must be on the sea.

The War between Spain and America.

The outbreak of war between Spain and America is an event which has rivetted the attention of the world, and later events have all combined to hold that attention. At the commencement of the war it can plainly be seen that steam will play one of the most important parts in the campaign. Fast sailing passenger steamers have been purchased by each of the contending Powers, and these will be fitted as auxiliary cruisers. The question of coal supply, too, will trouble Spain, if not America, the former being so far from her bases. It can easily be seen, too, that a great deal will depend upon the efficiency of the engineering staff of both Navies, and however powerfully armed, armoured and manned a vessel may be, if her engines and machinery get out of order, and the men in charge are not competent to set things right, she is helpless to prevent herself falling an easy prey to the enemy. It would be a terrible strain on the best of warships to race across the Atlantic, and if Spain has to rush what few vessels she has left in her ports to the other side of the ocean they will be sadly in need of repair when they reach their destination—if they ever do. Their destination will be, of course, the American coast or Cuba. And if Cuban ports are closed to them by the blockading ships there is nothing left for them to do but bring about a fight without delay, or return as best they can. Spain has reluctantly engaged in the struggle, for there is no doubt whatever that the odds are against her, and this is a fact which will gain her the sympathy of many people. There may have been expressions of good feeling towards the United States in the press, but there are a great many people in whose breasts the high-handed proceedings of the United States in the Venezuelan business still rankles, and we think that if Spain were to come out of the present struggle victorious it would teach the United States a much-needed lesson.

The Effect of the Present War on British Trade.

The war now in progress between Spain and America is a matter which must very much interest British taxpayers. First of all it must be borne in mind that an enormous trade in food stuffs is carried on between this country and the United States, and that any serious stoppage of this supply might force this country to intervene on the side of the United States, especially if it is thought well to declare food contraband of war. Quite three-fourths of the wheat supply of this country imported from America, as is a good deal of our meat, and even now the price of wheat is going up and should Spain prove victorious on the seas the price is likely to rise higher. Both belligerents will exercise the right of search, and ships carrying goods which have been declared contraband of war will be liable to confiscation. The owners, too, would receive no compensation. Of course if the searchers made a mistake and the result of the search proved that no contraband of war was on board, the owners in this case could claim damages. Should the United States succeed in destroying or seriously crippling the Spanish Fleet the rest will be fairly easy. She could pour troops into Cuba as fast as she chose, together with supplies for these troops, whereas the Spaniards in Cuba would be practically starving, for unless Spain is unable to get food to the soldiers she has in the island at present, that which can be procured there will be found to be insufficient to last any length of time. America has great wealth and resources, while the longer the war lasts the more difficult Spain will find it to obtain money. However, under the circumstances it will be interesting to watch the effect of the war upon our trade and food supplies.



THE "NOMOS" PROTECTIVE COMPOSITIONS FOR SHIPS' BOTTOMS.

MESSRS. R. T. BRUCE & CO., of 5, Commercial Road, Hull, have just issued a handsomely printed booklet, containing a list of vessels that have been coated with their well-known anti-corrosive paint "Nomos," and other interesting particulars. In this list are found the names of vessels belonging to the most important ship-owning companies, at home and abroad. No less than 65 vessels, ranging from 500 to nearly 3,000 tons register, coated with this composition, belong to the port of Hamburg. There are two north of England ports, however, which can beat this record; for Sunderland owners have applied the protective coating to 125 of their vessels, while Newcastle owners have used it in nearly 100 instances. Glasgow owners have also shown their confidence in the effectiveness of "Nomos" by using it in an equal number of cases. The leading firms of Hull, including Messrs. Thos. Wilson, Sons & Co., and Messrs. Bailey & Leetham, also use it. Messrs. Wilson have used this coating for their vessels since it was first introduced

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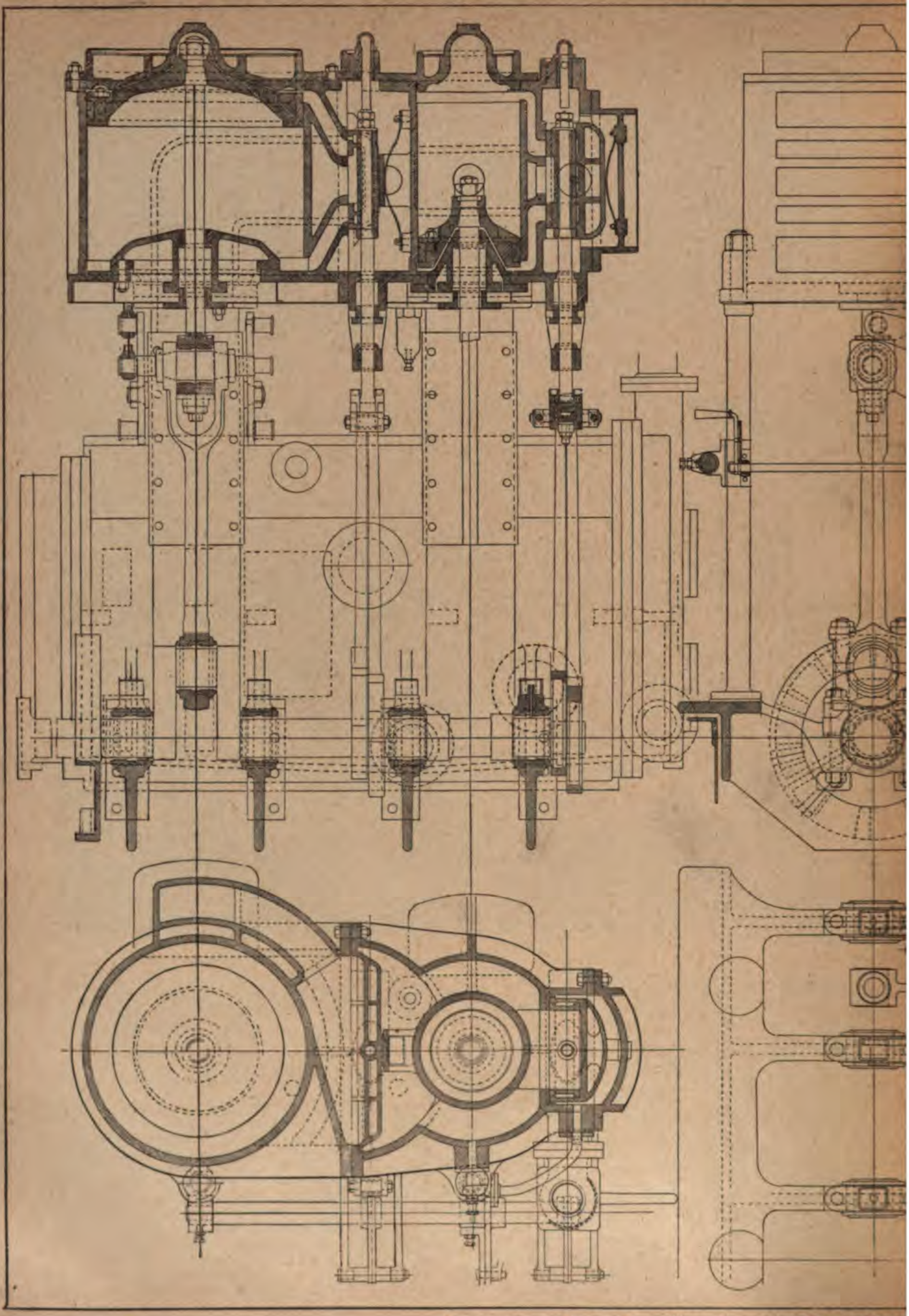
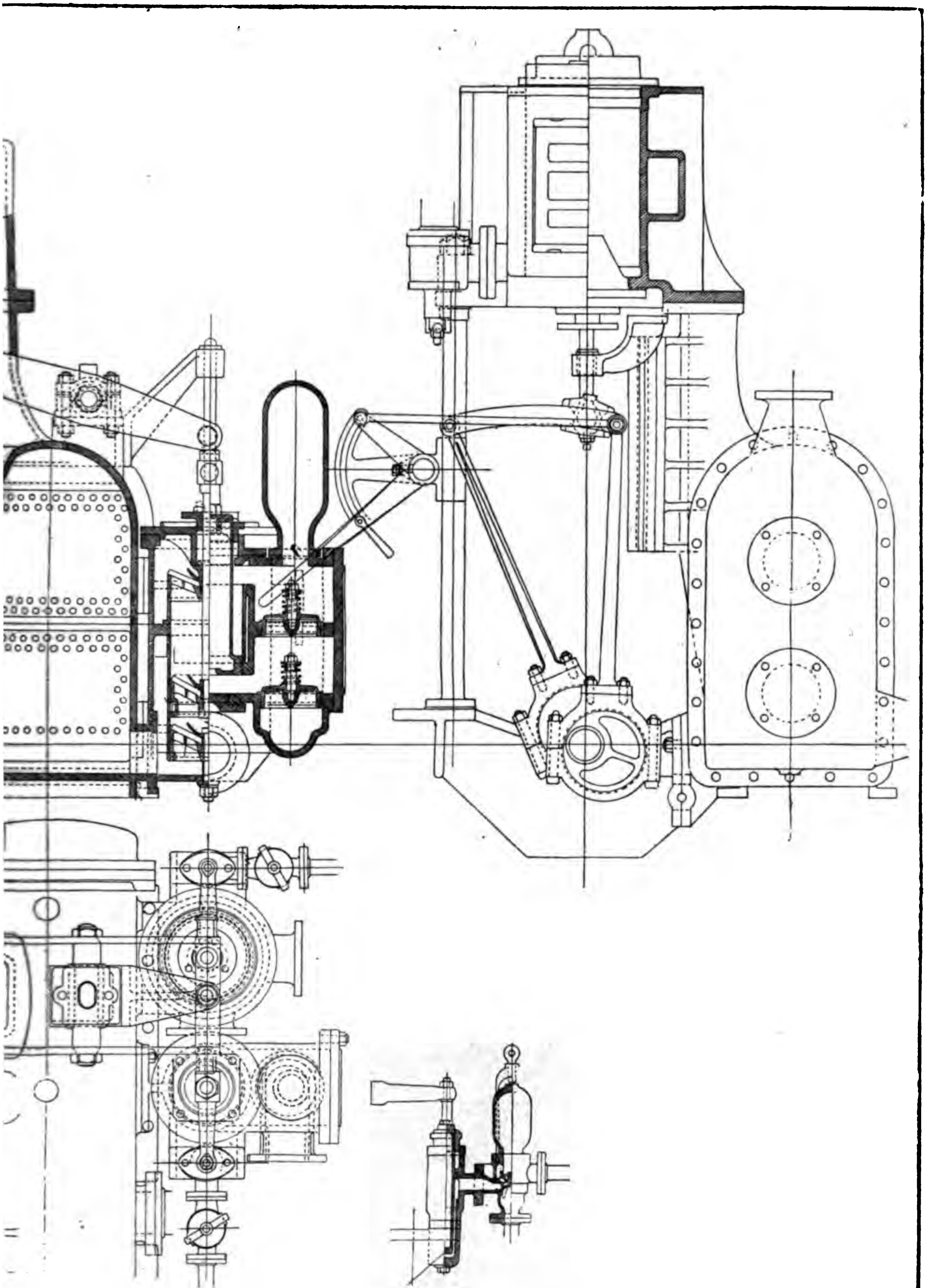


ENGINES OF THE DOUBLE-SCREW FERRY STEAMER "BELL-BROO



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nearly eleven years ago. Their *clientele* is a most varied one, comprising among others, the British Admiralty, the owners of several ocean liners and large cargo steamers, yachts, trawlers, tugs, launches, sailing vessels, wood smacks, &c. We have seen a list of vessels coated by Messrs. Bruce, from March 1st to June 10th, 1887, and could not help observing the vast strides made by the firm, on comparing that list contained in a single sheet of paper, with the 35 pages of ships' names, in the booklet recently issued. It is remarkable too, and highly creditable to the firm, that most of the owners mentioned in the list published over 10 years ago, are to be found among the names of the owners who are given as still using the compositions.

The booklet also contains three pages of results obtained from "Nomos" applications, and 15 pages of testimonials illustrating not only the effectiveness of "Nomos," but also the excellent results following the use of the firm's "Farola" anti-corrosive compositions in ships' holds, and for emigrant fittings, boot-tops, &c. These compositions are manufactured in several colours, and are supplied mixed, and ready for use. They cover a very large surface and are very easily applied. A list of firms that have used "Farola"—or rather a selection from the list—is given at the end of the booklet, and is quite sufficient to show the favour with which it is regarded by shipowners.

The accompanying illustration shows the result of a test on the bottom of the New South Wales Government steamer *Jupiter*, when in the Sutherland dry dock, Sydney, January 14th, 1898. The clear portion shows the "Nomos" protective composition.

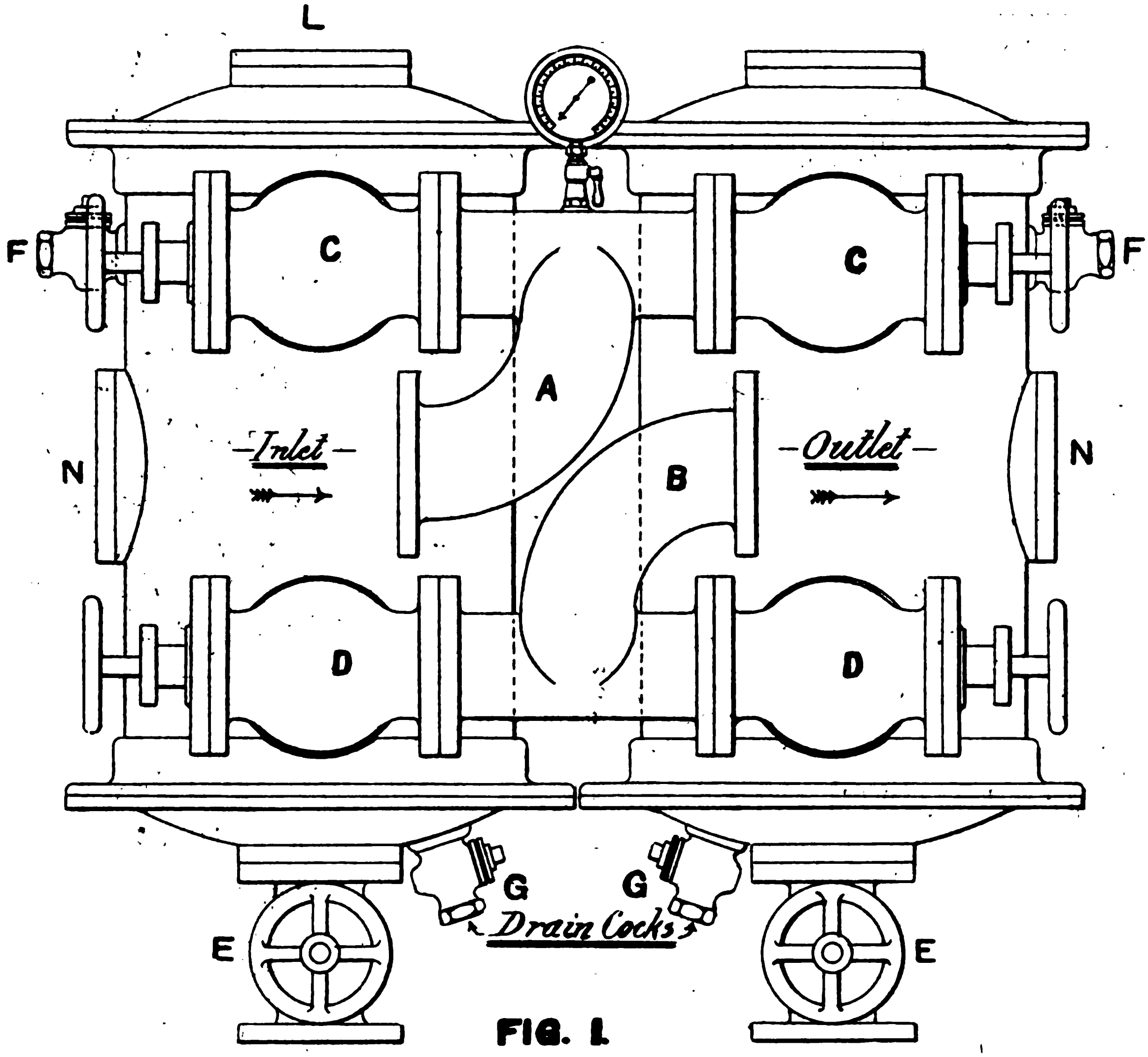


FIG. 1.

THE REEVES PATENT FEED-WATER FILTER.

In our issue of June, 1895, we gave a description and drawings of the Reeves Patent Feed-water Filter as it was then made, we now have pleasure in describing and illustrating the latest development, which the manufacturers term the "Twin" type.

From the adjoining diagrams it will be seen that Fig. 1 is a side elevation of the filter, Fig. 2 is a plan of the same, and Fig. 3 is a transverse sectional view. This type of filter, as its name implies, consists of a dual chambered device, each chamber, which is cylindrical, being coupled together by the inlet and outlet valve branches.

The chambers are fitted internally at the top and bottom with open-ended perforated wrought steel cones H and J, the space between the cones being tightly packed with coarsely granulated soft wood sawdust.

The bottom, or outlet perforated cones J are covered on their inner sides with triple gauze cones K, to prevent the possibility of the escape of any of the absorbent filtering material. The water from the hot well enters the two chambers simultaneously through the common inlet bend A, and the coupled inlet valves C, passing thence through the top perforated cones H; it permeates the sawdust, and escapes through the gauze cones K, the bottom perforated cones J, out through the coupled outlet valves D, and the common outlet bend B to the boiler. Hot water "jet" cocks F connected to the water space of the boilers, are fitted to the top or inlet end of each chamber, and straight through "blow-out" or sluice valves E are fitted to the bottom end of each chamber communicating direct with the internal space containing the absorbent filtering material M.

The "blow-out" valves E may be connected to the ship's side, or led into a convenient drain into which the oil-laden sawdust may be discharged. The chambers may be worked conjointly or independently, either chamber providing a filtering bye-pass to its fellow. Constant filtration is thus maintained, and the important advantage is secured that it is practically beyond the control of the engineer in charge to at any time supply other than filtered water to the boiler.

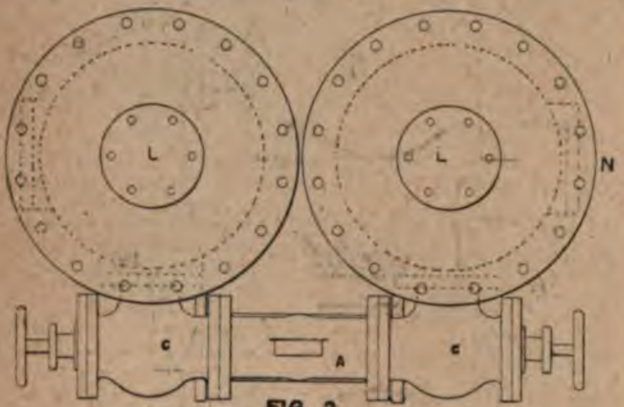


FIG. 2

As a filtering medium we understand that it has been found that compressed sawdust offers no resistance to the free passage of the feed water, consequently there is no extra load put upon the pump or feed pipes.

It may be briefly explained that the action taking place during filtration is as follows:—The oily water upon entering the filter permeates the porous granulations of the sawdust through and through, so that both oil and water are absorbed. The sawdust, however, having a special affinity for greasy matter retains the oil, allowing the water alone to pass in a purified condition. As the sawdust becomes saturated with oil, absorption ceases, the oily water then passes round the granulations instead of through them, until it reaches a depth in the bed where the sawdust is unsaturated and absorption is still possible.

It is an interesting fact to note that under ordinary conditions a fully charged filter will run for fourteen days without attention and do good work, but in all cases the life of the filtering medium is of course entirely dependent upon the quantity of oil held in suspension in the feed water.

When the sawdust has become sufficiently saturated with oil, the cleaning-out operation is carried out as follows:—The inlet and outlet valves C and D of whichever chamber it is desired to empty, are shut down, and the hot water "jet" cock F from the boiler is opened. The "blow-out" valve E on the bottom is then opened out full, the oil laden sawdust being almost immediately expelled. The hot water "jet cock" F and "blow-out" E are then shut, the charging hole cover L removed, and a fresh charge of sawdust, which has been previously mixed with water to the consistency of a very thin porridge, poured in, the bottom drain cock G being open during the filling process to allow the water to run off and the sawdust to settle down into a compact mass. When the filter is quite full of sawdust, the charging hole cover L is replaced, the drain cock G closed, and the chamber again placed in circuit. The other chamber may then be emptied and recharged in a similar manner.

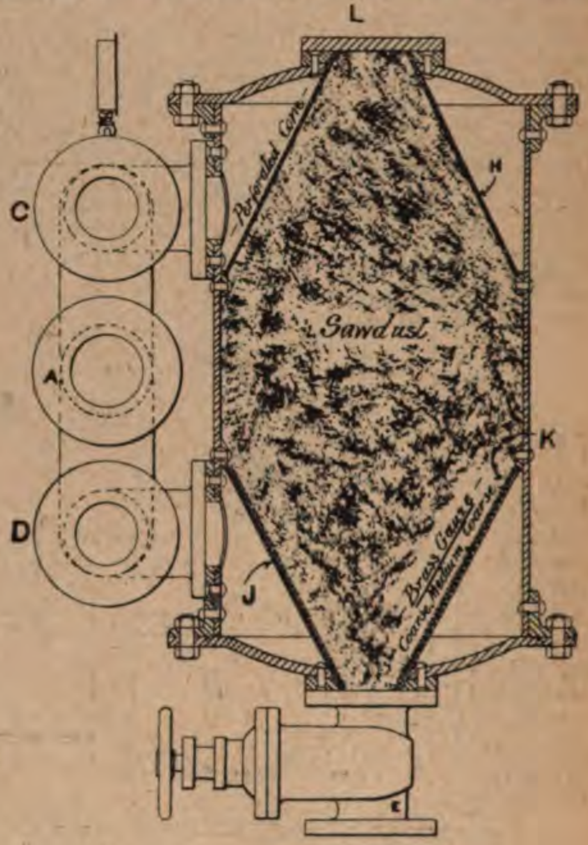


FIG. 3

These filters are manufactured by the Reeves Patent Filters Company, Limited, of 39, Victoria Street, Westminster, London, S.W.

BELLEVILLE BOILER.

A CORRESPONDENT writes:—Much has been said and written against the adoption of the Belleville boiler for use on Her Majesty's ships; but it is evident the innovation is one that has come to stay, and that the wisdom of the Admiralty in adopting the Belleville boiler has already been more than justified. The experience of the *Powerful* on her voyage out to China is quoted as an instance of the impracticability of these boilers, owing to their heavy coal consumption. It is a fact that on her trials the *Powerful*, as well as the *Terrible* had particularly light coal consumption, and it is evident that if the *Powerful* had steamed out to the East at anything like a speed for economic results her coal consumption would have been less than it has been shown to be. But the whole secret of the matter is that since the *Powerful* and *Terrible* were built great improvements have been made in the Belleville boilers, and the addition of economisers in the uptakes. These save a very large percentage of coal, and it has been abundantly proved in the case of the *Diadem*, and more recently the dock trials of the *Niobe*, that wonderfully economic results can be achieved. In the case of the *Niobe*, with any two of her thirty boilers at work, the main engines were driven at 70 revolutions per minute, and steam was also found for all the auxiliary engines at the same time. The experiences the Admiralty has had in these new first-class cruisers will doubtless lead to the adoption of economisers in the *Powerful* and *Terrible*. If this is done it will lead to the maintenance of great speed, with fewer boilers, and to a large saving in coal consumption. The fact that Belleville boilers, with economisers, have been adopted for first-class battleships, such as the *Vengeance*, building at Barrow, in addition to the many cruisers now under construction, shows that the Admiralty, at any rate, are satisfied, and experience will prove in the long run that this new type of boiler can be used with advantage in high-speed ocean liners.

STEAM FERRY—(" BELL-BROOK").

ON page 17 of our last issue we gave a description of the double-screw ferry steamer *Bell-Brook*, with illustrations of the vessel. In our present issue we give two double-page illustrations of her engines and boilers. The engines are of the compound vertical inverted type, and are capable of developing 300 I.H.P. The engines have each two cylinders 10¾ in. and 22½ in. in diameter respectively, with a length of stroke of 14½ in., the reversing gear is of the ordinary link motion type, and is adapted for operation by hand. The boilers are cylindrical in shape, of 7 ft. 10 in. diameter and 8 ft. 4 in. in length. They are each fitted with two cylindrical furnaces of 30 in. diameter, and discharge their products of combustion into an independent funnel of 17 in. diameter.

Miscellaneous.

Danville Asbestos Plaster.—We have received a pamphlet from the Asbestos and Asbestic Co., of 27, Billiter Buildings, London, E.C, giving particulars of the Danville "Asbestic" Plaster, which is manufactured by them. This plaster is an absolutely fireproof material produced from incombustible asbestos of a particular kind, which, we understand, is only procurable from the Danville Mines, Quebec, Canada, now the property of the Asbestos and Asbestic Co., Limited. Besides being sound-proof, or in other words, a non-conductor of sound, it is claimed to be a non-conductor of heat, and being fibrous and possessed of great elasticity, there is no liability to chip, crack, or crumble. In this characteristic it lends itself with great facility for non-conductive purposes, such as the coating of boilers, steam pipes, and other devices which it is desirable to coat with a layer of non-conductive material. We are given to understand that it has already been used in this way on a steam-yacht, with very successful results. As this plaster can be used for a variety of purposes it is important to note that it contains no hair or organic matter of any description, and therefore it can contain no germs, and being vermin proof, its sanitary advantages are very considerable. Another important feature is that it preserves iron and steel from corrosive action, a great advantage for a covering material.

Honour to a Clyde Shipbuilder.—Last month the degree of Doctor of Laws (LL.D.) was conferred on Mr. John Inglis, the well-known Clyde shipbuilder, by the University of Glasgow. Mr. Inglis, when a young man, attended the University and studied mathematics under Dr. Blackburn; engineering and naval architecture under Professor Macquorn Rankine; and physics under Professor William Thomson, now Lord Kelvin. In presenting him to the latter, on the occasion of conferring the degree, Professor Moir said: A distinguished alumnus of this University, Mr. Inglis adopted the family profession of shipbuilder and engineer, and became connected with the well-known company of which he is now the head. He has been president of the Institution of Engineers and Shipbuilders in Scotland; is president-elect of the Institution of Marine Engineers in London,, and a member of Council of the Institution of Naval Architects. He has always manifested the deepest interest in the scientific side of his profession, and the papers contributed by him to the various institutions with which he is connected have shown him to be at once a capable thinker and a graceful writer. The Senate, recognising in Mr. Inglis a leader of industry in a branch of great importance to both the city and the University, desires to mark its sense of the services rendered, and confers on him the degree of Doctor of Laws. Dr. Inglis's career, though uneventful, has been one of assiduous devotion to the profession of naval architecture, especially as directed to scientific investigation and analysis, and the fruits of this have not only been reflected in his various papers and addresses before the Institute of Naval Architects and kindred societies, but have also been seen in the many noteworthy steam vessels of special classes produced by his firm at Pointhouse Shipyard.

Resistance and Speed of Ships.—This formed the title of a lengthy paper read before the graduate section ofthe Institution of Engineers and Shipbuilders at its last meeting, by Mr. Edward H. Parker, the Secretary of the Institution. The author said his paper would consider (1) the various elements which unite to form the total opposing force which a vessel experiences in its onward progress through the water; (2) the relations of ship dimensions and form to resistance; (3) the effect of change of trim, and the addition of excrescences to the hull; (4) the peculiarities of wave forms raised by ship-shape bodies. The paper was mainly an exposition of the theories and line of experimental research initiated by Dr. William Froude, and since carried on, on behalf of our Admiralty, by his son, Mr. R. E. Froude, but supplemented and rendered practically interesting and suggestive by conclusions and deductions come to by the author, from his experience under the Froudes—father and son—and his connection with the exhaustive system of model experiments carried on by Messrs. Denny Bros., of Dumbarton, with which firm Mr. Parker was for many years employed.

Joyeuse.—The steam yacht *Joyeuse*, designed and built by Day, Summers & Co., Northam Iron Works, Southampton, for Mr. Hamilton Fletcher, of Pyt House, Tisbury, was launched by the firm on Saturday, April 23rd. The dimensions of the yacht are:—Length, between perpendiculars, 145 ft.; breadth 22 ft.; depth, 14 ft.; tonnage 350. She is to be fitted with triple-expansion machinery for 500 I.H.P, the cylinders being 14 in., 22 in., and 37 in. diameter, and the stroke 27 in.; the boiler is 12 ft. 6 in. diameter, and 10 ft. long, the working pressure being 160 lbs. The vessel and machinery have been constructed to Lloyd's highest class, and under special survey. The accommodation below deck consists of large dining saloon, 20 ft. by 12 ft., placed forward of the machinery; this apartment is panelled entirely with mahogany, the panelling being of a very elaborate nature, the furniture is also of mahogany, and this wood is used throughout the vessel for the dado and furniture of all the state-rooms, which are six in number; the officers' and crew's accommodation is in the fore part of the yacht. On deck the deckhouses extend for about one-third the vessel's length amidships, the smoking-room and companion entrance to owner's state cabins being fitted in the after end, and a large saloon with staircase to dining saloon below, in the forward end, the engine and boiler casings and galley, occupy the centre of the deck-house, a shade deck is fitted from end to end of the deck-houses, extending to the sides of the vessel. The yacht is to be fitted with electric light throughout by Messrs. Scott & Mountain, Messrs. Bow McLachlan & Co. are supplying the steam steering gear, which will be fitted on the rudder head, and the steam windlass is from Thos. Reid & Sons, the boats have been built by Summers & Payne.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from March 25th to April 25th, 1898:—

Aborn, George, fleet engineer to the *Vivid*, additional, as engineer overseer at the works of the London and Glasgow Shipbuilding and Engineering Co., to date March 31st.

Apps, H. E. G., artificer engineer to the *Victory*, to date April 1st.

Baker, Fredk. G., artificer engineer to the *Pembroke*, to date April 1st.

Bickell, Wm. T., artificer engineer to the *Victory*, to date April 1st.

Burner, Wm. H., fleet engineer to the *Raleigh*.

Canning, Henry T., assistant engineer to the *Howe*, undated.

Carey, John J., staff engineer to the *Pembroke*, additional, for the *Northumberland*, undated.

Cleave, Thomas W., engineer to the *Vernon*, additional, for charge of machinery of steamboats and for electric light duties, to date April 2nd.

Crabtree, E., assistant engineer, promoted to the rank of engineer in Her Majesty's fleet.

Dawson, Fredk. G., engineer to the *Vivid*, additional, for the *Shark*, to date April 20th.

Denny, John T. H., fleet engineer to the *Boscawen*, additional, for the *Minotaur*, undated.

Dunn, Charles F., engineer to the *Galatea*, to date April 2nd.

Ellis, Jos. H. W. H., staff engineer to the *Vivid*, additional, for the *Retribution*, undated.

Faulds, A. G. J., acting chief engineer, has been placed on the retired list of engineers.

Follett, Samuel G., fleet engineer, to be lent to the *Devastation* on being temporarily commissioned, undated.

Frost, James G., fleet engineer to the *Vivid*, additional, for the *Sybille*, undated.

Gundry, John G., artificer engineer to the *Victory*, additional, for the *Firequeen* (temporary), to date April 1st.

Hender, William J., chief engineer to the *Magdala*, additional, for the *Plassy*, undated.

Heyes, Henry W., engineer, to be lent to the *Devastation*, on being temporarily commissioned, undated.

Highet, W., engineer, has been promoted to the rank of senior engineer.

Humphreys, H., engineer, promoted to the rank of chief engineer in Her Majesty's fleet.

Jenkin, John H., engineer to the *Assaye*, undated.

Johnson, W. C., assistant engineer, promoted to the rank of engineer in Her Majesty's fleet.

Kelly, Frederick, assistant engineer, to the *Ramillies*, to date April 1st.

Kennedy, John, artificer engineer to the *Victory*, to date April 1st.

Kennedy, John, artificer engineer to the *Raleigh*, undated.

Lawton, William R., engineer to the *Victory*, for the *Wizard*, to date April 12th.

Leverett, H. T., artificer engineer to the *Victory*, to date April 1st.

Lyon, Francis H., probationary assistant engineer to the *Anson*, to date April 12th.

Miller, Matthew R., fleet engineer to the *Boscawen*, additional, for the *Agincourt*, undated.

Mitchell, James, artificer engineer to the *Victory*, to date April 1st.

Moore, Thos. A., artificer engineer to the *Vivid* (supernumerary), to date April 1st.

Northcott, Alfred F. R., artificer engineer to the *Albacore* (temporary), to date April 1st.

Orchard, Geo. S., artificer engineer to the *Collingwood*, additional, for the *Amelia*, lent, to date April 1st.

Pepperell, Wm. F., artificer engineer to the *Pembroke*, to date April 1st.

Ramsay, George, chief engineer to the *Pembroke*, additional, for the *Northumberland*, undated.

Roberts, Ivor E. S., assistant engineer, to be lent to the *Devastation* on being temporarily commissioned, undated.

Roxburgh, Wm. H., artificer engineer to the *Pembroke* (supernumerary), to date April 1st.

Sharp, Adolphus W., artificer engineer to the *Victory* (supernumerary), to date April 1st.

Sherratt, J., engineer, R.N.R., has been promoted to the rank of senior engineer.

Short, E. A., engineer, promoted to the rank of chief engineer in Her Majesty's fleet.

Starr, Geo. H., probationary assistant engineer, to the *Centurion*, to date March 25th.

Stephens, Lindsay J., engineer to the *Assaye*, undated.

St. John, E. F., artificer engineer to the *Vivid* (temporary), to date April 1st.

Sydenham, F. W., assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

Thomsett, F. D., engineer, promoted to the rank of chief engineer in Her Majesty's fleet.

Thorne, Chas. W., fleet engineer to the *Cleopatra*, undated.

Watch, John S., fleet engineer to the *Victory*, additional, for the *Neptune*, to date March 31st.

Watkins, B. J., engineer, promoted to the rank of chief engineer in Her Majesty's fleet.

Watkins, Benjamin J., chief engineer to the *Pembroke*, additional, for the *Tartar*, to date April 20th.

White, William H., fleet engineer to the *Vivid*, additional, for the *Active*.

Wootton, J., chief inspector of machinery, has been placed on the Retired List, at his own request.

Young, Edwin W., artificer engineer to the *Pembroke*, to date April 1st.

Young, Edward W., artificer engineer to the *Pembroke*, additional for the *Comus*, undated.

HOAR & BROWN'S HARDWOOD MARKET REPORT, APRIL 21st. 1898.

TEAK.	Logs. Loads.	Planks. Loads.	Blocks. Loads.	Total. Loads.
Stock, 1st April	12,417	3,383	14	15,814
Landings	17	270	—	287
	12,434	3,653	14	16,101
Deliveries	240	438	—	678
Stock, 15th April	12,194	3,215	14	15,423

The market remains very firm and there is every probability of a further advance for prime cargoes. Orders placed recently represent a considerable quantity of stock and enquiries continue numerous. Very little floating stock remains unsold. The wood here largely consists of second-class shipments, for which there is little demand and values for this quality are depressed.

PLANKS.—The demand has somewhat fallen off and stocks are large. Prices, however, are fairly maintained, and shippers ask a slight increase for forward delivery. A large quantity of inferior wood is arriving, badly cut, wormy, and knotty, and intending purchasers should exercise care in making their selection from piled stocks, as the faults are then to a great extent hidden.

MAHOGANY.—The minimum has fallen slightly and difficulty has been experienced in clearing up public sale parcels.

Honduras.—Large-size logs of good quality have been selling well, but the market is overdone with medium to small wood, for which the demand has fallen off. The two last steamers for this season have arrived, and contain mostly small and curved logs.

Nicaraguan.—Much business has been done overside, and this mild-natured wood finds favour at rather advanced figures.

Tobasco.—Good roey logs meet with ready sale; panel qualities also are in fair demand; the smaller sizes, owing to short supply, have been realizing fair rates.

Minatitlan.—Enquiries are limited, and while other woods can be obtained at low figures, this class is not in demand.

Tecolutla.—Some good consignments would sell well, as the stocks have lately much decreased.

Panama.—A considerable proportion of the landed stocks consists of very inferior conditioned wood, and buyers cannot be found for this class except at ruinous figures. The few larger logs of sound character sell very readily.

African.—Prices fell very low indeed, and buyers of cheap wood took the opportunity of purchasing largely with the ultimate result of driving the market up about 25 per cent., but prices are still very low and there is plenty of room for speculative buyers.

Cuba.—The demand is very active, as old stocks are entirely gone, and that now offering commands so high a figure buyers are afraid of launching out too strongly. The same remarks apply to the St. Domingo shipments.

CEDAR.—Prices remain firm for Honduras, Tobasco, and Cuba, and there is a fair demand. The stocks of Paraguay are ample for the requirements, which are exceedingly light.

African.—The hard quality of this wood is against the use of it for boat-building or cigar-box making, but the large sizes attract buyers for other purposes.

Australian.—Long, well squared logs are wanted, but the short wood, which has been so plentiful of late, is difficult to dispose of, not being required.

WALNUT.—The price for small logs has receded to a low point, and business is very restricted. On the other hand some 24 in. parcels have been selling exceptionally well.

The lower grades of planks and boards are not moving at all well; the higher class wood is doing better.

Sequoia.—Values have improved 5 per cent. Stocks are light, and the demand is healthy.

Kaurie Pine.—Logs are dormant, but planks hold their price, and a fair business is being done.

American Whitewood.—Offers from the other side continue to attract attention, and keen competition prevails. The market is now at its lowest.

Jarrah.—The demand, which appears to be extending, is larger than the supply, and prices are expected to advance.

GREENHEART.—The enquiries run upon small piling sizes, which appear difficult to obtain. Large sizes are also wanted for the London market. Prices remain unchanged.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

FOR the quarter of the year which ended with March the aggregate output of new tonnage in the Clyde reached 75,500 tons, this figure only having been exceeded on five previous occasions, viz., 1896, when it reached 94,600 tons; 1892, when it was 92,000; 1890, when it was 81,000; and 1883, when it was 83,600 tons. Of course the comparatively big output this year is due in large measure to the postponed activity in launching caused by the recent engineering struggle. It is to some extent also accounted for by the phenomenal briskness in placing new contracts, which has prevailed since the close of the labour war. Since the year began over 240,000 tons of new work have been contracted for, 130,000 tons of this having been placed during March alone: quite a record month's bookings. A large proportion of this was Government work.

This briskness in booking and contracts has not, however, been maintained; April, in fact—or as much of it as has gone—showing but poor results in this respect, material having advanced so much in price, and with the prospect of a still further rise, as well as the inevitable advance in workmen's wages, builders have been safeguarding themselves in their quotations; and this, doubtless, has helped to bring about the cessation in bookings. The impossibility, too, of giving anything like reasonable delivery has been a factor in the case.

Trials have been made during the month with the Clyde river steamer *Meg Merrilees* after having had her low-pressure steam engine compounded by Messrs. A. & J. Inglis, of Pointhouse, and having been fitted with two water-tube boilers of the "Haythorn" type, in place of the "Haystack" boiler formerly in use. As this is among the first—if not positively the first—installation of the water-tube type of boiler on a purely passenger steamer "plying for hire,"—private pleasure yachts and steam launches being of course excepted—great interest attaches to the results of the trials with the vessel as altered. These results as yet, however, have not been made public. The substitution of the water-tube for the haystack type of boiler, in any case, ensures great economy in space and weight of propelling power, besides other advantages conducive to rapid and economical steam raising. The Board of Trade, while not relaxing their rule by which a passenger vessel carrying boilers of this or of any other "novel" type, cannot be certificated for a longer period at first than three months, have in this case promised an immediate extension of the three months period provided nothing serious goes wrong during the first three months' working.

Two noteworthy launches of naval ships took place during April. These were the *Hermes*, second-class cruiser from the stocks at Fairfield, and the *Ariadne*, first-class cruiser, from Clydebank. The *Hermes* is the first of two sister vessels which represent an improvement on the *Juno* class of which Fairfield built two, the *Venus* and *Diana*, the contract for them having been placed in December, 1896. The dimensions of the *Hermes* are: Length, between perpendiculars, 350 ft.; breadth, extreme, 54 ft.; displacement, 5,600 tons. The propelling machinery will consist of two sets of triple-expansion engines fitted in separate engine-rooms, each set having four inverted cylinders and four cranks. The crank-thrust and propeller shafting is of forged steel, and hollow. The propellers are of gunmetal, each propeller having three adjustable blades. Steam will be supplied by 18 Belleville boilers of the latest type, fitted with economisers and adapted for a working pressure of 300 lbs. With the power provided it is expected that the vessel will attain a speed of 17 knots, under usual conditions, at sea.

The Clydebank cruiser *Ariadne* is of the *Diadem* type, but with greater engine-power. Her dimensions are: Length, over all, 462 ft. 6 in.; length between perpendiculars, 435 ft.; breadth (extreme), 69 ft.; displacement, 11,000 tons. The coal capacity, at normal draught, is about 1,000 tons, but twice the amount can be carried, should necessity arise. The armament consists of four six-inch quick-firing guns with shields, two on the upper deck and two on the forecastle deck; twelve six-inch quick-firing guns fitted in armour casements of Harveyised steel—eight on the main deck and four on upper; fourteen 12-pounder and a large number of smaller and machine guns. Accommodation is provided for about 700 officers and men. The propelling machinery will consist of two sets of triple-expansion engines. Each set will have four inverted cylinders working on four cranks. It is expected that a speed of over 20 knots will be attained under ordinary conditions.

Messrs. Fleming & Ferguson, engineers and shipbuilders, Paisley, received, about the end of March, an order from the Government of Western Australia for a twin-screw tug for service at Freemantle.

Messrs. Bow, McLachlan & Co., engineers, Paisley, have contracted to supply a set of engines of 1,500 I.H.P., for a steamer being built by Messrs. Carmichael, McLean & Co., of Greenock, to the order of the Stoomvart-Maatschappij, Wederland.

Messrs. Murdoch & Murray, shipbuilders, Port-Glasgow, have contracted with Liverpool shipowners to build a steel screw cargo and passenger steamer, of about 850 tons deadweight capacity. The machinery will be of the triple-expansion type, and will be supplied by Messrs. Hutson & Son, Glasgow.

Messrs. Scott & Co., engineers and shipbuilders, Greenock, are now having reconstructed, at an outlay of several thousand pounds, an extensive range of buildings including joiners' shop and other premises at their shipyard which were destroyed by fire about six months ago. The new buildings will extend from the corner of their dockyard at Victoria Harbour to their mid shipyard in Main Street. These two yards, which have until now been separated by a considerable strip of ground, most of it used for saw-mill purposes, have now been conjoined, and in accordance with an arrangement with the Police Board the line of the street, very narrow at one point, has been set back several feet. Early in the month Messrs. Scott & Co., launched the steel screw steamer *Kuikiang*, for the China Navigation Co., Limited, the third of a fine fleet of six steamers which are building for the same company.

The Greenock Harbour Trust have leased a portion of the tract of vacant ground and foreshore at Garvel Park, lying to the east of Garvel Dock, to Messrs. Taylor & Mitchell for the formation of a new shipbuilding yard. The first-named gentleman was for a considerable period shipyard manager to Messrs. Anderson, Rodger & Co., Port-Glasgow, and is well known in shipbuilding and shipping circles on the Clyde. The site of the new yard affords good launching facilities, and no time will be lost in laying down berths and workshops and plant of the most modern description.

The shipyard at Yoker, opposite Renfrew, established, and for many years carried on by Messrs. Napier, Shanks & Bell—now dissolved—is likely to be carried on by one of the original partners, who is understood to have enlisted another gentleman into the proprietary.

The shipyard and dry dock at Alloa is being re-started by a new company, under the title of the Alloa Dry Dock and Engineering Co. The dock here is the only one on the Forth opening directly into the channel of the river.

The Irvine Shipbuilding Co., at Irvine, on the Ayrshire coast, have contracted with Messrs. John Kennedy & Sons, coal merchants, Glasgow, to build a coasting steamer 120 ft. long and having a carrying capacity of 250 tons.

The shipbuilding yards of Dundee have been sharing satisfactorily in the plethora of orders for new tonnage which has obtained since the cessation of the engineering struggle, and the work now on hand and in prospect points to an extended period of activity. Messrs. Gourlay Brothers & Co.—who a few days ago launched a saloon paddle steamer for the General Steam Navigation Co. for passenger service on the Thames—have contracted to build a cargo and passenger steamer, 330 ft. long, for Messrs. Huddart, Parker & Co., of Melbourne. This makes the fourth vessel which the firm have at present on the stocks, besides which they have extensive overhauls on several steamers lying in dock. The Caledon Shipbuilding and Engineering Co. have also four new steamers under construction, besides four barges for the Dundee Harbour Trustees. Three of the steamers are for Messrs. Wilson, Sons & Co., Hull, and one for Messrs. F. Leyland & Co., Liverpool. In addition, two steamers for cargo and passenger service have just been ordered from the firm by the Clyde Shipping Co., and two steamers, recently launched from their yard are at present undergoing their outfit. The Dundee Shipbuilding Co. have seven steam trawlers on the stocks, and are engaged fitting out two such vessels recently launched.

Unless, however, the Harbour Trustees of Dundee can see their way to effect some much-needed enlargements and improvements on the docks in the port, shipbuilders may have some difficulty, or may find it quite impossible, to undertake the class of work at present occupying their stocks. This matter was referred to very pointedly by Mr. C. G. Gourlay at the launch of the paddle-steamer *Eagle* for the Thames passenger service above referred to. Speaking of the size of the steamer—which was 265 ft. long, 30 ft. moulded breadth, by 10½ ft. deep—he said the docks in Dundee were so limited that his firm would not care to go very much larger. They had, unfortunately, to launch the vessel in a very incomplete state as to her sponson wings and paddle-boxes in order that she might get through the lockway into the docks, and this was certainly not as it should be. This question—which Mr. Gourlay is not alone in having referred to—is no doubt a large one, but the Trustees must surely now be alive to the fact that it must be faced if Dundee as a port is to keep abreast of modern requirements, and of its own importance as a commercial city.

Glasgow's magnificent new graving dock—in some of its dimensions the largest in the world—was officially opened by Lord Provost Richmond, on the 27th ult., on the occasion of the annual inspection of the harbour works by the Clyde Trustees. The ceremony, however, was robbed of a good deal of its notability and *eclat* through the fact that for quite ten days previously the dock had been actually in use, and as many as eight vessels docked and undocked for hull cleaning and painting. This was mainly owing to the abnormal demand which has been made on the graving accommodation lately, the two older docks being totally inadequate to cope with the number of steamers craving admission, and was also in some measure due, perhaps, to the delay which had taken place in having the pumping arrangements perfected long after all other features were complete, and the loss of revenue thereby entailed. The two first vessels to enter the new dock were the *Hibernian* of the Allan Line fleet, and the *Bellasco* belonging to the fleet of Messrs. Bell Brothers & McLellan, Glasgow. After having been safely floated in, pumping was started, all going most satisfactorily and smoothly, and in one hour and forty minutes the large vessels were high and dry on the keel blocks. The depth of water in the dock was 28½ft., and as the dock is 880 ft. long by 115 ft. wide at top, and 81 ft. 8 in. at bottom, the total quantity of water dealt with was over 13,760,000 gallons, or about 61,500 tons. The discharge of this immense volume of water in the time stated—viz., one hour forty minutes, which was twenty minutes under the time guaranteed—is a notable achievement, and reflects credit on the contractors for the pumping machinery, Messrs. Andrew Barclay & Co., Kilmarnock. The installation, which is perhaps the largest appertaining to any dock in the world, comprises two pairs of pumping engines equal to over 3,000 I.H.P., having double-throw crank shafts coupled direct to the shafts of the centrifugal pumps. The latter special and essential parts of the installation were manufactured by Messrs. Gwynne & Co., Holborn, London.

The new graving dock being constructed at Troon is now nearing completion, and should in the course of a few months be practically finished. The floor is almost all concreted, and three or four steps only require to be formed on the north side to finish the retaining walls. The dock sill is laid, and the two entrance walls are well advanced. The workmen are at present busily engaged blasting out the entrance to the dock beside the coffer dam. The pump chamber will soon be in a position to allow pumps and all connections to be laid down, The dimensions of the dock are: extreme length, 364 ft.; depth from cope, 30 ft. 3 in.; width at bottom, 50 ft.; and at top, 36 ft. There will be 22 ft. of water on the sill at high-water spring tides.

There has now been at work for some months on the south quay of the Princes Dock, Glasgow, and giving every satisfaction, a steam-travelling crane of novel type and great size, the production of Messrs. George Russell & Co., of Motherwell. The crane is self propelling along rails laid at a gauge of 24 ft. 9 in. The carriage is elevated, giving a clear headway below of 14 ft. 6 in., there being two lines of rails between those on which the crane carriage runs, so that the trams can pass underneath the crane. Besides general work the crane is used for loading coal in railway waggons lifted bodily in a cradle. The radius of the jib is 42 ft. 3 in., the height from level of quay to centre of jib being 72 ft., and the vertical range of the lifting block 95 ft. The lifting, slewing and tipping are performed very quickly, and the movements being controlled by the driver, who is stationed in a house with windows which command a clear view of the load. Messrs. Russell & Co. are now engaged upon a somewhat similar but still larger crane for the Mersey Docks and Harbour Board to be placed on the south quay of the Canada Graving Dock. It will be of 40-tons capacity, and will travel on rails of 25 ft. gauge, the radius of jib being variable from 85 ft. to 40 ft. The crane will be fitted with two pairs of Russell's patent hydraulic engines.

One of the most unique and least known of Glasgow's multifarious industries is that of the manufacture of naval range-finders. The instruments in question are the invention of Professors Barr and Stroud, and on the occasion of the first annual festive gathering of the workmen employed in the manufacture, held on the 14th ult., Professor Barr gave an interesting account of how the range-finder came to be invented. In 1888 the War Office authorities wanted an instrument suitable for use in the field. Professor Stroud and himself went to work, and in three weeks they had got all the essentials of the instrument. It had taken them ten years to get it to its present state, and they were not finished yet. Their scheme was accepted. In 1891 the Admiralty wanted a range-finder for use on board ship. The upshot was that their instrument of 4½ ft. base completely beat the instrument of 8 ft. base that was tried against it. Since this the demand for the instrument had grown. Very few people were aware that such an industry was carried on in Glasgow. There was practically the only range-finder manufactory in the world.

The date fixed for the visit of the Institute of Engineers and Shipbuilders in Scotland to the town and neighbourhood of Sheffield—reference to which was made in last month's Notes—is 15th June. The visit will extend over three days, and there will be meetings for the reading and discussion of papers, visits to works, and trips into the surrounding country. Something like 150 members of the Institution have signified their intention of joining in the visit. A general desire has been expressed in industrial and commercial circles in Sheffield to extend a hearty welcome to the Scottish Institution, and a local Reception Committee has been formed with the Lord Mayor as chairman, and Professor Hardwick as hon. secretary.

Marine Engineers' Examination.—At the examination held on April 12th, 13th, and 14th, the following candidate passed for Extra First Class Engineer, Mr. P. Dunbar, of Glasgow. He was prepared by Mr. W. H. Thorn, 5, Waterville Terrace. Noth Shields. Fifty pupils have passed in the above grade from this establishment.

THE TYNE.

(From our own Correspondent.)

Shipbuilding.—A month ago, the expectation was very generally entertained on Tyneside that a portion of the new Government programme in shipbuilding would be secured by one or other of the local firms that had been invited to send in estimates. The expectation has, however, been disappointed, and the reason for this is doubtless to be found in the circumstance that the tenders of the Tyne builders were considerably higher than those of their competitors in other districts. It is satisfactory to know that the loss of the Government contracts will not be seriously felt by either employers or workpeople, as there is plenty of other work to be dealt with, and as freights are still showing an upward tendency the future outlook is more indicative of augmentation than decrease in the volume of general work. There have not been any considerable additions to the work in hand during the current month; but this is accounted for by the fact that the whole of the firms are pretty fully supplied in the matter of orders, and cannot offer delivery till an advanced date in 1899. Besides, prices have stiffened since the opening of the year, and owners are consequently under the necessity of holding off till the conditions for adding to their property in new tonnage become more favourable. That time will not be just yet, however; for independently of a probable enhancement of values arising from war complications, there is certain to be an addition made to productive cost by advances of wages to the workmen. The largest and most powerful trade union connected with the shipbuilding industry has already taken up an attitude which is pretty sure to result in the wages of the members being advanced before the year is much older. The union referred to is that known as the Boilermakers' and Iron Shipbuilders' Society, the general secretary of which is Mr. R. Knight, Lifton House, Newcastle. That official has addressed a communication to the Shipbuilding Employers' Association, requesting that arrangements may be made for a conference between the representatives of both parties to consider the question of an advance of wages to the society's members in the shipyards. The request is made in accordance with an agreement entered into between the society mentioned and the Employers' Association some years ago, and which, it is understood, has worked very satisfactorily so far. This agreement requires that a conference, when applied for by either side, must take place within a fortnight from the date of application, and it is therefore to be presumed that the meeting now asked for will be held by the end of the present month. The agreement also provides, that any alteration of the wages rates which may be demanded, shall not exceed 5 per cent., and that no further change shall take place before the expiration of six months. There is no reason to doubt that this advance will be conceded on the present occasion, for the employers in this district have never yet resisted a claim which might be supposed to possess any pretensions to reasonableness, and it cannot be denied that in regard to the present claim, there are circumstances which seem to justify it. The other sections of workmen will most assuredly follow the example set them by the society referred to, and in all cases it is probable that the employers will be found willing to concede the same advance as may be given to the boilermakers in the first instance. Taking these considerations into account, there is reason to expect that the whole matter will be settled amicably, and that no interruption to work will take place. At the moment there appears to us but one circumstance which might hinder the fulfilment of this forecast, and that is that one or other of the different sections of operatives might try to obtain a larger advance than that mentioned. It may be taken for granted that any such demand for exceptional treatment would not be entertained by the employers, and if put forward, can only result in friction and loss to those concerned.

The splendid Chilian cruiser *O'Higgins*, which was launched at Elswick some months ago, has been having her trials during the past few days, and at the time of writing, is on an extended trip, to last 24 hours. It is understood that she will be formally delivered to her owners very shortly, and will leave the Tyne for South America immediately afterwards. Among the accessories on board which come under the head of auxiliary machinery is a powerful "Yaryan" evaporator for rendering sea water fit for drinking and cooking purposes, as well as supplementing the boiler feed to the requisite extent. This type of evaporator has been largely used in warships for many years past, and has invariably given the greatest satisfaction in results. In the present instance, we have no doubt, that the effectiveness of the evaporator will be again amply demonstrated; but we hope to get the official details as to its performance during the trials, and these we shall have pleasure in embodying in a future report.

Messrs. Armstrong, Whitworth & Co. have been favoured with a commission to build a vessel for the Cunard Co., and it is understood that the engines also will be built on the Tyne. This, we believe, is the first occasion on which the Cunard Co. have requisitioned the Tyne for a contribution to their fine fleet, and there is little doubt their determination to distribute their orders over a wider area than that comprised in the shipbuilding centres of the Clyde, will ultimately prove advantageous to the shareholders, as competition between the two great rivers is certain to produce an improvement—if such is possible—in the quality of the work. It is understood that there are other Cunard orders in the market, and it is by no means improbable that one of them may be placed on the Tyne. As we have already indicated, there is not room for many further contracts in this district, excepting on terms of long delivery; but to secure such a client as the Cunard Co., more than one firm might be disposed to make a special effort, by instituting double shifts, by extending premises, or by inducing other customers to postpone delivery beyond the dates fixed.

Messrs. C. S. Swan & Hunter continue to be exceedingly busy in their shipbuilding department, and are making rapid progress with the construction of an immense floating dock in their pontoon yard.

The two yards at Hepburn—Messrs. Stephenson's and Messrs. Hawthorn, Leslie & Co.'s—are also quite busy; while at Messrs. Wigham Richardson & Co.'s establishment night-shift is maintained in some departments.

Messrs. Dobson & Co.'s berths are fully occupied, and at Messrs. Wood & Skinner's yard there are four vessels of varying sizes on the stocks. The Tyne Shipbuilding Co. are as busy as possible with three large vessels on the stocks and one in the water being fitted out. Messrs. Readhead have just launched a fine vessel of between 5,000 and 6,000 tons capacity for Messrs. Runciman, of Newcastle, and the keel for a successor is already being placed in the vacated berth. There are three other vessels in progress, and the frame-turners are being kept on double shift. In the repairing departments business is also good.

The addition of Lord Northborne to the Board of Directors of the Palmer's Co., which has just been announced, has caused much satisfaction at Jarrow and on Tyneside generally, as it is believed his lordship's connection with the company is likely to aid in extending its sphere of business operations. At the moment the various departments of the company's works are quite busy, and there is no reason to apprehend any change in this satisfactory state of matters for a long time to come.

Engineering.—The leading marine engine works continue to be very busy, and in every instance night work is maintained. Messrs. Robert Stephenson & Co., whose locomotive shops are at present quite full of work, have just received an order for a set of engines, to be fitted in a large vessel now building at the Low Walker yard of Messrs. Armstrong, Whitworth & Co. It is understood that the Wallsend Slipway Co will supply the machinery for the Cunard boat, now in progress at the last-mentioned shipbuilding establishment, and this is by no means the most important contract the firm have in hand. At the North-Eastern Marine Engineering Works important extensions are being carried out, which, when completed, cannot fail to greatly increase the resources of the firm. The Neptune Engine works are kept in full activity, and at the St. Peter's works the usual state of exceptional briskness is maintained.

We understand that Messrs. Lumsden & Blair, who for some years have carried on a successful engineering business at the High Level End, Gateshead, have removed to larger premises at Wallsend, where they intend extending their sphere of operations in general engineering work. The well-known firm of Messrs. John Rogerson & Co. have taken premises in Bankwell Road, Gateshead, in which they have commenced the business of general engineers, and have already secured a fair measure of success. The premises are well equipped with plant and appliances for carrying on work in an expeditious and economical manner, and though contracts are not as yet very numerous, there is no doubt that before many weeks are past the place will have work enough to tax its resources to the uttermost. The works of Messrs. Wm. Hindson & Co., in the same locality, are very fully employed, the anchor shops being exceptionally busy.

The Combination Metallic Packing Co., of Lombard Street, Newcastle, are having a large demand for their speciality, and the company's works at Gateshead are consequently very busy. Electrical engineering works at Gateshead and Newcastle are kept going briskly, and both forges and foundries are well off for orders. It is understood that the manufacture of rolled steel chain will be commenced on the Tyne shortly. A company has been formed having some gentlemen of good local standing on its board of directors, and there is every reason to expect a prosperous future for the enterprise.

Blyth.—The Blyth Shipbuilding Co. have their building berths fully occupied, and are also well provided with repairing work. At the Blyth Dry Dock Co's. works, a number of important repair contracts have been dealt with during the past four months, and there is still a good deal of work in hand. During the past few weeks coal shipments from the port have increased considerably.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—Some important devlopments in connection with the shipbuilding industry are now about to be witnessed on the Wear. It is understood that Messrs. Doxford have acquired a considerable area contiguous to their yard, and that they are about to re-arrange the building berths in the latter, with a view to the possibility of building more and larger boats simultaneously than they have been able to do hitherto. This firm have become noted for their enterprise, and the announcement of the new move about to be made, however welcome it may be, will not, locally, cause much surprise. At the other end of the town a change is also about to be made, which is scarcely less interesting from a local standpoint than that already referred to. This is an addition to Messrs. Austin's yard, which will enable them to lay out two additional building berths, making five in all, which will be at the disposal of the firm. The new berths will be formed in a piece of ground at the west end of the yard, which was formerly the site of a glass bottle manufactory, but which has now been cleared and levelled for the carrying out of Messrs. Austin's project. This firm have recently put down new pumping plant of the latest and most effective description in connection with their graving dock, and are in other respects adding to the productive capacity of their works. There is at present in hand a plentiful supply of both new and old work.

Messrs. Osborne & Graham are said to have booked orders lately, and there is now more work in their yard than has been noticeable for some time. At Messrs. Priestman & Co.'s yard business is brisk, and Messrs. R. Thompsons & Sons are also having a sufficiency of orders. The great oil-carrying steamer, *Tuscarora*, has been launched from the yard of Sir James Laing & Sons, and is now being completed alongside the yard. Messrs. Short Brothers have received an order for two large steamers from London owners, and this order, with others previously on the books, will keep the firm busy well into next year. One of the two Japanese twin-screw mail steamers which the firm are building, have also been put into the water within the past few days. The statement appears in a weekly shipbuilding paper that Messrs. Thompson & Sons, Sunderland, have received an order from the East Yorkshire Steamship Co., Limited, Goole, for the construction of a cargo steamer of 4,400 tons deadweight for general trade, and to be named the *Riplingham*. This is sufficiently specific, only that it is not stated which of the two Sunderland firms that are known by the name of "Thompson & Sons" is referred to. The Strand Shipbuilding Co., Limited, who have now a large amount of work in progress, are about to put down new plate rolls of much larger capacity than those at present in use, and are also making arrangements to put down several other machines of modern and effective types. The company have at present a good deal of repair work in hand.

Messrs. J. L. Thompson & Sons have launched a large meat carrying steamer for Messrs. Brightman & Turner, and the vessel is now being fitted out beside the yard. It is understood that the firm have three other vessels in progress for the same owners, one of which is nearly ready for putting off the stocks, while the other two are in the framing and plating stages respectively.

Messrs. Blumer & Co. have four vessels on the stocks, and at the Sunderland Shipbuilding Co.'s yard there are an equal number in progress. Messrs. Bartram & Sons have as much work in hand as they can deal with, and are understood to have other orders in reserve. Both the Wear Commissioners' graving docks are occupied with vessels undergoing repairs, and it may be stated that they have scarcely ever been without occupants—even for a day—since the new arrangements were inaugurated by which vessels can be docked and undocked, with such extraordinary facility as is now experienced.

Engineering.—At the Palmer's Hill Engine Works there are, in addition to the new work in hand, several locally owned vessels getting their engines overhauled, or being fitted with new boilers. Orders for Dickinson's patent crank shaft continue to be numerous, and in most cases these orders have to be executed with great despatch.

Messrs. George Clark, Limited, of the Southwick Engine Works, have booked an important contract lately, and at Messrs. Doxford's establishment a great pressure of work exists. The North Eastern Works (South Dock) are also showing exceptional activity, and at Messrs. MacColl & Pollock's establishment, Wreath Quay, some additional orders have been secured.

Mr. J. W. Donovan's patent stern tube has been recently fitted to several steamers of an important class, and it is understood that owing to the very marked advantages resulting from the adoption of the contrivance in a large number of instances, many new orders have been received. There is also a steadily increasing demand for the patent "improved" propellers, manufactured by Messrs. Wilcox Brothers, of 68, John Street, which in every case are designed to suit the lines of the vessels proposed to be fitted. A proportion of steel is used in the manufacture of these propellers, with the view, no doubt, of imparting a higher degree of efficiency.

The Hartlepools.—Shipbuilding is still brisk, there being a considerable amount of repair work in the port to supplement the new contracts. In the engineering works a high degree of briskness continues to be maintained, and the forges and foundries attached thereto are kept very fully employed. The local steel works are in active operation; but at the docks quietude prevails both in the coal, shipping and timber importation.

Stockton.—Messrs. Craig, Taylor & Co. have acquired additional land adjoining their yard, which they intend to utilize for extension purposes. It is stated that by the changes about to be entered on the firm will very largely increase the productive capacity of their yard. Messrs. Blair & Co. keep very busy, all departments of the work being kept going night and day. The firm have to supply the engines for several large vessels building on the Wear, besides those building (for which their engines are ordered) on the Tees and elsewhere.

Middlesbro'.—Messrs. Craggs & Son are said to have received an order for a high-class cargo steamer of large size from the Royal Hungarian Steam Navigation Co. of Buda Pesth, and also booked orders for four other steamers of about 1,800 tons each. The other yards at this centre are well provided with work. Engineering shops are busy, and foundries are showing improvement. Steel works continue to be fully employed.

Darlington.—The works of the Darlington Forge Co. are well supplied with orders for ship and engine forgings and castings, and the output this year has up to the present been exceptionally heavy.

THE MERSEY.

(From our own Correspondent.)

WITH the close of the month, the hostile relations between the United States and Spain, and the uncertainty as to possible developments tend to unsettle the outlook, but apart from this the position with regard to all branches of the engineering trade in this district is in every way satisfactory. Although the excessive pressure of work which was being pushed forward immediately after the settlement of the recent dispute, has slackened off, there are still far more orders offering than engineering firms are able to entertain for delivery within anything like a reasonable period. In not a few instances they have been compelled to suspend quoting at all for new work, and although a good deal of this is being held in abeyance until engineering firms are in a position to undertake new orders, a considerable amount of business has been recently going into other quarters, and American tool makers especially have been able to secure not a few orders that would otherwise have been placed with English firms. The exceptional activity in the shipbuilding industry is necessarily having its effect on marine engineering shops throughout Lancashire, and the principal local firms have a large weight of work in hand both in heavy tools and in other directions, as a result of the pressure which is now being put upon shipbuilding establishments in all parts of the country. Notwithstanding the extreme activity in all branches of engineering, the effects of the recent prolonged strike are not yet overcome, so far as the workmen are concerned, and the returns of the engineering trade unions still show more than the average number of members in receipt of out-of-work support, which may be taken as indicating that a considerable number of men who came out during the recent dispute have not been taken on. Generally reports from engineering establishments are that the men are settling down satisfactorily under the altered conditions, but here and there friction has arisen in connection with the new arrangements, especially with regard to overtime, and in the boiler-making trade, which has perhaps never been so busy for several years past, as it is at present, there is a probability of wages questions coming forward before long which may perhaps cause some temporary disturbance, although it is not likely that this will result in any serious struggle between the employers and the workmen.

Messrs. Laird Bros. report nothing of any special moment in connection with the work in hand at their shipbuilding yard. It is, however, stated that the Prince of Monaco is about to visit England with a view of inspecting the new yacht that is being built for him by the firm.

An improved apparatus is being introduced by Messrs. W. T. Glover & Co., of Salford, which will no doubt be fully appreciated by all who are interested in the working of electric motors, either for land or marine requirements. This invention is a patent starting and controlling switch, which the firm have applied very successfully in their own works, where they have over a score in use. The switch is essentially a safe one, and is arranged with a specially constructed worm gear in such a manner that it is impossible to start the motor too quickly, although the switching off is instantaneous. Should the current fail, or be cut off, the switch instantly cuts itself out of circuit automatically. The switch will not remain in the "on" position at any time if there be no current, neither can it be left partially on, as when the automatic arm is not home, the switch cuts itself out the moment the operator takes his hand away. The operator is therefore bound to put it full on, which he can only do slowly, whereas it will cut itself out, or the operator may cut it out instantly. The switch is entirely self-contained, and is much more compactly designed than the ordinary arrangements constructed for the same purpose. The entire switch is enclosed in a cast-iron box, the terminals being mounted on a marble slab; the coils are embedded in cement, so that the whole is fire-proof. The terminals are made sufficiently large to easily carry the full horse-power. It may be added that a motor controlled by one of these switches may be safely left in charge of a labourer.

Messrs. Fletcher, Russell & Co., Limited, of Warrington, have introduced some further novelties in gas and petroleum heated forges, beyond those to which we referred last month. One of these is a forge what is claimed to be the only system by which steel tools can be forged without injury by the use of gas. The apparatus is specially suitable for small odd forgings, and creates no nuisance either in lighting or use. Starting at cold, a slide rest tool can be repaired or shaped in two minutes. The hearth is 14 in. by 16½ in. Both the blower and the blow-pipe can be taken away if required, and used separately for brazing. The forge can be heated with either gas or petroleum. Other of the firm's novelties include petroleum heated lead pots and bolt-heaters of a handy, portable form, very suitable for use, either on shipboard or in works. In these heaters a tank of oil is carried on one side, which is partially filled. On to the top of the oil air is pumped, creating a pressure on the oil which forces it through a pipe into a burner inside an iron casing immediately under the lead pot or the heater for bolts. This burner is heated by a temporary ignition of spirits, and the petroleum then issues forth in a spray very much in the same manner as the Well's light, and is thrown in a powerful heating jet underneath the lead pot or bolt heater.

Last month brief reference was made in these Notes to large extensions that have been carried out at the works of Messrs. Crossley Brothers, Limited, of Openshaw, and a few additional details which we have been able to obtain will no doubt be interesting. One of the chief portions of the extension is a new department that has been erected and set apart exclusively for the manufacture of oil engines. This consists of a large range of shops fitted throughout with new and modern machinery, most of which is of special design. The manufacture of oil engines, it may be added, has now become a very important branch of Messrs. Crossley's business, and they are constantly experimenting in the developing of improvements in this class of motor. Large extensions have also been made in the foundry, as the firm find that even with their present capacity of passing through 130 tons of castings per week, this is not adequate for their requirements. Other additional features include an entirely new hydraulic installation for working their cranes, capstans, &c.; the fitting up of a complete brass finishing department, and entirely new pattern stores. In fact the works have been thoroughly re-organised; there has been a large introduction of milling machines, and a considerable number of labour-saving tools have been put down, many of which are of American design, which they were compelled to order as one result of the recent engineering dispute, but the bulk of English manufacture. Amongst the special American tools which they have adopted, perhaps the most noticeable is a key-seater, which Messrs. Crossley were the first to introduce into this country, and they have now a second of these tools at work. These two American machines have displaced five slotting machines which were previously used for cutting out the key-seatings, and although very small tools, they will take from the largest fly-wheels down to the smallest articles that require to be operated upon, whilst they are so simple in arrangement that practically an unskilled man can work them. Other American tools include automatic capstan lathes, convertible turning and boring machines, with a number of specially designed milling tools. Messrs. Crossley have also laid down a special tool department for making all their cutters, jigs, and gauges to meet the requirements of producing all parts of their engines on the interchangeable system.

In the iron trade, although no very great weight of business has been put through during the past month, the tendency has been in the direction of improvement, and prices generally have shown a stronger tone, with the result that speculative operators who have previously been selling on a low basis, have manifested more anxiety to cover. In pig iron, although the demand has not been very active, customers generally only buying for immediate requirements, business has here and there been coming forward in increasing quantity. Local makers have been receiving enquiries rather in excess of what they have been disposed to sell, and they are readily getting their list rates of 45s. 6d. for forge to 48s. 6d. for foundry, less 2½ delivered Manchester, on transactions put through. District makers occupy a very strong position; Lincolnshire makers have very little iron to offer, and although there is no advance on their list rates, they are extremely firm at 43s. for forge to 45s. 6d. for foundry, net delivered Manchester. Derbyshire is practically out of the market, with quotations scarcely more than nominal; delivered Manchester, however, 48s. 6d. to 49s. net cash, may be taken as about the minimum for foundry qualities. Outside brands have shown some irregularity in price. Middlesbrough is without appreciable change, and ranges from about 48s. 7d. and 48s. 10d. for G.M.B.'s, to 49s. 7d. as the makers' quotations, for delivery by rail, Manchester. Scotch iron is somewhat easier, and delivered Mersey ports could be bought at 47s. to 47s. 3d. for Glengarnock, and 47s. 9d. for Eglinton, with 2s. 3d. more at Manchester docks. American pig iron is becoming difficult to obtain, and ordinary brands are not quoted under about 48s. to 48s. 6d. net at Manchester docks.

In the finished iron trade, bars meet with an active demand, with better prices obtainable. Special lines might still be placed with local makers at £5 12s. 6d. to £5 13s. 9d., but in some cases £5 17s. 6d. to £6 is quoted. North Staffordshire qualities now average £6. Sheets and hoops continue only in slow request, but prices are unaltered, sheets averaging about £6 15s. and hoops remaining at £6 10s. for random to £6 15s. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

An exceptionally active demand has been coming forward on both raw and manufactured steel, and there has been a strong upward move in prices. Foundry hematites range from 58s. 6d. to 59s. 6d. and 60s., less 2½, according to brand; local billets average about £4 6s. 3d. net cash. Steel bars vary considerably, some local makes averaging £6 to £6 5s. with other quotations as high as £6 10s. and £6 12s. 6d. For boiler plates as much as £6 17s. 6d. is now quoted, and orders could scarcely be placed under about £6 12s. 6d. delivered in this district.

With the close of the month the anticipations of an upward move in list rates have been realised, and an advance of ¼d. per lb. has been announced on brazed brass tubes, brass and copper wire, and rolled metals. Delivered Manchester district quotations for these are now as under:—Brazed brass tubes, 8¼d.; common rolled brass, 6¼d.; common brass wire, 6½d.; copper wire. 7½d. per lb.

Business in the timber trade has been quiet, and deliveries unsatisfactory. Stocks generally are ample for the season of the year, and although there is little change in values, these are only with difficulty maintained. In East Indian teak the arrivals of both logs and planks have been light, and enquiry has been rather more active, with slightly improved prices obtained on recent sales; the stock, however, is adequate. Only one cargo of greenheart has arrived, and there has been a steady demand, but stocks are sufficient.

In the coal trade of this district the position has during the past month been considerable strengthened. This has been due to a largely increased shipping demand on all descriptions of fuel, brought about by the South Wales strike, which has compelled customers who usually get their supplies from the above district to cover their requirements in other quarters. On shipping orders considerably advanced prices have been obtained during the last few weeks. During the excitement accompanying the commencement of the dispute, as much as 5s. above late rates was in some cases being asked on shipping orders, and although prices have since got to something more like a reasonable basis, advances of 2s. to 2s. 6d. are being readily got; steam coal averaging 10s. 6d. up to 11s. 6d. delivered Mersey ports, with rather more than this realised in special cases, where guaranteed prompt delivery is required. Other descriptions of fuel have also shown similar advances on shipping orders. The increased demand on the above account has necessarily helped to clear away a good deal of stock that seemed likely to hang upon the hands of colliery owners during the ensuing summer, and has not only stopped any downward move in prices, but is not unlikely to enable colliery owners to hold out for better prices on the large contracts that usually come upon the market in the summer. It has also for the time being tended to harden up prices on the inland trade, although it is exceptional where official advances on list rates have been advanced. Supplies of house coal are moving off readily, with pits on full time, and prices firm at the winter rates, best Wigan Arley averaging 10s. 6d. te 11s.; Pemberton four-ft. and seconds Arley, 8s. 6d. to 9s. 6d.; and common house coal 7s. 6d. per ton at the pit-mouth. As regards steam and forge qualities the output is being disposed of without difficulty, a considerable weight of stock having in many cases been filled up, whilst 6d. to 1s. above recent minimum quotations is being generally got, 7s. to 7s. 6d. being now the average rates at the pit-mouth. Notwithstanding an increased production of slack, supplies of engine fuel are moving away, and there is a hardening in prices, although no quotable advance. At the pit-mouth best qualities are quoted 4s. 9d. to 5s. 3d. per ton; medium, 3s. 9d. to 4s. 3d.; and common sorts, 3s. 3d. to 3s. 6d.

BELFAST.

(*From our own Correspondent.*)

WE are pleased to report that the same busy state of affairs continues in the shipbuilding and engineering trades here, evidence of which can be seen in the various extensions to buildings in progress in both the large works. Owing to the very large vessels they are constructing, Messrs. Harland & Wolff have found it necessary to extend their works very considerably indeed. They have had to remove several shops from the centre of their yard and rebuild them on the other side of the Queen's Road outside the yard proper altogether. The machinery in these shops is driven by electricity carried by cables across and at a long distance along Queen's Road, the power being obtained from their extensive electric plant inside their yard. It is indeed marvellous to note the many uses to which this great invention can now be applied, and how clean and nice the machinery moves under its vital unseen power.

Messrs. Workman, Clark & Co., Limited, are also enlarging their works, and have erected new joiners' shops, paint shops, and wood drying store, etc. A sketch of Mr. F. Workman, the senior partner of this firm, recently appeared in a contemporary, accompanied by some statistics, which will serve to show the rapid development this firm has made within a very short time. This yard was first started in 1879. four acres of land on the north bank of the river Lagan having been leased from the Belfast Harbour Commissioners, but the rapid development of the firm soon outgrew this small space, and now this one yard alone covers fourteen acres. In 1891 the company decided to go in for the construction of marine engines, and Mr. Chas. E. Allan, of Glasgow, joined the firm. An additional nine acres of ground was secured on the south side of the river, adjacent to the large graving docks and the 100-ton crane. In 1896 this section of the works was almost completely destroyed by fire, but these premises have since been rebuilt and are now in full working order. It says much for the enterprise of this firm that an establishment which once stood on a site of four acres has developed until the works, comprising two distinct shipyards and two engine works, cover an area of over 50 acres, and employ 4,000 men.

On the 8th of April another leviathan steamer was launched from the yard of Messrs. Harland & Wolff. This was the twin-screw steamer *New England*, the latest addition to the Dominion Line. This steamer has a tonnage of nearly 11,600 tons, and is in many respects a second *Majestic*. She is designed to carry a large number of first and second-class, also steerage passengers. The saloon is situated in a deckhouse erected on the hurricane deck with seating accommodation for nearly 200 people, and is surmounted by a very elaborate dome skylight, with handsome stained glass and decorated panels. The majority of the state-rooms are in the same house as the saloon, and on the deck below there is a handsome second-class saloon capable of seating 100 persons, and on this deck there are also first and second-class state-rooms, together with officers' quarters and other accommodation. Aft in the poop is a well-arranged closed steerage, also smoking-room on poop deck. The ship is also fitted with refrigerating machinery for meat and provisions, and is lighted throughout with electricity. This ship has water ballast tanks fore and aft, and will be capable of crossing the Atlantic at any season of the year with cargo. The machinery consists of two sets of quadruple-expansion engines of the latest description. The *New England* is advertised to sail from Liverpool on the 30th June.

The steamship *Winifreda*, which recently left the same builders hands, has just run her outward maiden voyage to New York from Gravesend. The distance, 3,336 miles, was covered in nine days eighteen hours, thus giving an average speed of 14·3 miles per hour. The *Winifreda* is the best of the five boats on the Wilson Furness-Leyland Line and is a credit to her builders.

On the 19th April Messrs. Workman, Clark & Co. launched from their south yard the steamship *Rippingham Grange*, which makes the sixth vessel built by this firm to the order of Messrs. Holder Bros. & Co. She has been built to the highest class of Lloyd's and Board of Trade requirements for carrying first and second-class passengers. Her leading dimensions are:—Length, 420 ft.; breadth, 54 ft.; depth, 32 ft. 6 in.; with a gross tonnage of 5,850. Her deadweight carrying capacity will be about 9,200 tons, and she has eleven powerful winches with derricks capable of lifting 10 tons. The principal holds and between decks will be insulated in the most approved manner; and refrigerating plant, capable of dealing with a large space will be fitted up. She is fitted with three large steel boilers fitted with Howden's forced draught, and her machinery, which will be capable of developing 3,200 I.H.P., will be fitted by her builders.

The steamship *Cyria*, which has been built by Messrs. Workman, Clark & Co. for the Cunard Co., ran a most successful trial trip in Belfast Lough on April 1st, and after adjustment of compasses, proceeded on her way to Liverpool.

During the month the steamship *Athos*, which belongs to the Atlas Steamship Co., and which has for some time past been in the hands of Messrs. MacColl & Co., for the purpose of receiving extensive alterations to hull and machinery, ran a very successful trial trip, after which she proceeded to take up her station in the fruit trade between New York and the West Indies.

The s.s. *Prussia*, late of the Hamburg-American Line, and built by Messrs. Harland & Wolff about two years ago, is at present receiving a most extensive overall and alteration to hull to suit her for a new trade, but she will be further noticed in a future issue.

We might also mention that several of the local shipowners are increasing their fleets with large ships both for coal and other imports, showing that trade all round is in a very promising condition at present.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—The revival of the shipbuilding trade brought about by the close of the engineers' strike and the delay which had consequently occurred in the completion of tonnage under construction, is fully maintained in this district. Builders are all very fully supplied with orders, and this is especially the case with Vickers, Sons, & Maxim, whose naval construction works at Barrow are very fully supplied with work. The most recent addition to the orders in hand is that of a 500-ton yacht for Sir William Wills, of Bristol. This, coupled with the order for a 8,400-ton steamer for the Pacific Steam Navigation Co., and two steamers for the British and African Co., represent an important accession of work, especially in view of the recent receipt of an order for the *Hogue*, one of the four belted cruisers reqired by the Admiralty, in addition to which the order for a 12,500-ton battleship was placed a few months ago. Vickers, Sons, & Maxim have not only these orders in hand, but a large telegraph cable laying steamer, two Clan Lline steamers, and a variety of other work, which is in various stages of completion. One of the effects of the engineers' strike is shown in the fact that not a single launch has occurred at the Barrow yard from the 17th of July last until 20th of April, when a small steam yacht, built for Mr. Platt, of Newark, was put into the water. On the 23rd of April the new Fleetwood and Belfast twin-screw Channel steamer was launched. She is larger than any of her predecessors built for this line, and has more power. She is built to steam at 20 knots, and will probably be found the fastest cross-channel steamer on the west coast. In July next the first-class cruiser *Amphitrite*, building for the Government, will be launched. She is well forward in construction and represents a greater deadweight than is usually regarded as wise to launch at, but the ground at Barrow is hard as concrete, and it is not only safe to launch at heavy tonnage, but the keeping of the vessel on the stocks as long as possible is a material help and convenience to the builders, whose workshops are at some distance from the dock where ships at Barrow take in their engines and general complete equipment. Much progress has been made with the construction of the cable steamer, and it is evident before the end of the year four other launches of large steamers will be made at the Barrow yard. There is naturally a big demand for shipbuilding material, and the tonnage in stock at the Barrow yard is greater than it has been for a considerable time past. There is much activity in the shipbuilding trade generally, and long hours are being worked in order to push forward the work in hand as speedily as possible. On the engineering side of the Barrow yard the greatest activity prevails, and a night shift is working regularly. This is not only necessary in order to bring up arrears of work, but to give the requisite attention to a large accession of orders that have come to hand since the strike terminated. Much work is furnished in the construction of water-tube boilers, principally of the Belleville type, and satisfactory tests are noted. There is also great activity in the ordinary cylindrical boiler trade, orders for which are very fully held. All the minor departments of the shipbuilding trade are well employed and prospects are decidedly cheerful.

West Cumberland.—There is a steady trade in shipbuilding circles in West Cumberland, but activity at the Workington yard is not so marked as it has been. Orders, however, are fairly well held.

Shipbuilding Material.—There is a very brisk demand for shipbuilding material of all descriptions, and makers are deluged with orders and are already very fully sold forward. Heavy and light plates are in brisk request, and the mills are kept up to their maximum of production. Prices are firmer and a trifle higher. Heavy plates are quoted at £5 12s. 6d. per ton net, and as the demand exceeds the supply, it is probable this price will soon be advanced. In sections and in heavy steel castings much business is being done, and the foundries are not only busily employed, but are working practically night and day.

The Hematite Trade.—A very brisk business is being done in hematite descriptions of pig-iron, although the war scare has considerably affected the warrant or speculative market. Business in Bessemer mixed Nos. is brisk at 50s. to 50s. 6d. per ton net, f.o.b., and warrant iron is at 49s. 6½d. net cash sellers, 49s. 6d. buyers. Stocks are lower on the month, and now stand at 174,861 tons, or 9,589 tons less than at the beginning of the year; 41 furnaces are in blast, as compared with 37 in the corresponding week of last year.

Shipping.—The shipping trade is well employed, and especially so in metal exports. During the year so far the exports have reached 150,178 tons of pig-iron and 164,280 tons of steel, as compared with 121,697 tons of pig-iron and 134,307 tons of steel in the corresponding period of last year, showing an increase of 28,481 tons of pig iron and 29,973 tons of steel.

Reviews.

A Manual on Laying Off. By Thos. H. Watson. London: Longmans, Green & Co. 1898.

Mr. Watson is so well-known as a successful ship designer that anything he has to tell as to his methods will be welcomed by his professional brethren. The present volume is not unworthy of his reputation. It is designed for the use of junior draughtsmen, apprentice loft-men and students. By the aid of very carefully worked out and numerous diagrams a great deal of the science of naval architecture is elucidated in a manner capable of being appreciated by the junior members of the craft. The ground covered is very extensive, it includes the design of warships, including sheathed cruisers, as well as of mercantile vessels and composite hulls. The whole is clearly and lucidly explained, with no unnecessary verbiage and copious cross references and a complete index economize space and time by facilitating reference and avoiding repetitions. The book will be undoubtedly of great value to an important class of hard-working and intelligent men, from whom in future years will be drawn the designers who will give us the improvements which shall make our present state of science seem unbecoming and antiquated.

Lubricants, Oils, and Greases. By I. I. Redwood. London and New York, Messrs. E. & F. N. Spon, Limited.

This is a very practical and instructive little treatise on a subject whose importance is constantly growing. With the fast running machinery of to-day perfect lubrication is an absolute necessity. The chemical composition of the lubricants which are used is also of the greatest importance in regard to their effect upon the substances with which they come in contact, especially in the case of those which meet the steam and thus, in course of circulation, may affect the purity of the feed and even eventually find their way into the boilers. The little work gives excellent practical hints as to the manufacture and testing of the various substances used for the purposes of lubrication. It also tells us of the most effective methods of applying them to the machinery. The hints given are of a thoroughly practical character, as the following extract will show. After dwelling on the waste of lubricant and the general annoyance caused by a heated bearing, Mr. Redwood says, "After such bearings have been taken apart, trued, and thoroughly cleaned, further heating may be prevented by mixing a small quantity of the best flour of sulphur with the lubricant." He adds that if first class flake graphite is obtainable it will be found preferable to the sulphur. The proper proportions are half an ounce of graphite to a pound of lubricant.

Torpedo Boat.—The Atlantic Transport Liner *Minnewaska* sailed from the Royal Albert Docks the beginning of April for New York, having on board a 20-knot torpedo boat by Yarrow & Co.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Delfyn.—On March 10th there was launched at North Shields, a steamer of about 142 tons gross, named the *Delfyn*, for J. P. Feding von Berkhout, Haarlem.

Active.—On March 21st there was launched at North Shields, an iron steam ketch, of about 160 tons gross, named the *Active*, for the Pelham Steam Fishing Co., Limited, Grimsby.

Steel Screw Steamer.—On Monday, March 21st, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, to the order of Messrs. Pile & Co., of London, a steel screw steamer, 240 ft. between perpendiculars, by 37 ft. breadth by 20 ft. depth, classed 100 A 1 at Lloyd's under special survey, flush deck type, having bridge house amidships and topgallant forecastle for crew. The officers' and engineers' messroom and accommodation is placed amidships alongside engine casing, whilst the captain and passengers are berthed in the bridge. The vessel is provided with steam winches by Mr. R. Welford, of Pallion, and steering gear by Messrs. Alley & MacLellan. Tri-compound engines by Messrs. MacColl & Pollock, of Sunderland, having cylinders 18½ in., 30 in. and 49 in. by 33 in. stroke, 160 lbs. working pressure. The steamer is built to carry about 2,400 tons deadweight on 17 ft. 4 in. draught, and is intended for the Baltic trade. During construction both hull and machinery have been inspected by Mr. Thos. Pile on behalf of the owners.

Copenhagen.—On March 22nd there was launched at Sunderland, for the Glasgow Shipowners' Co., Limited, a steel schooner-rigged steamer, of about 3,296 tons gross, named the *Copenhagen*.

Elizabeth Holland.—On March 23rd Messrs. S. P. Austin & Son, Limited, launched at Sunderland a steel well-deck screw steamer of the following dimensions:—Length, 264 ft.; breadth, 39 ft.; and depth, moulded, 19 ft. 5 in. She will be classed 100 A1 in Lloyd's Register, the estimated deadweight capacity being about 2,600 tons. The machinery is to be supplied by Messrs. George Clark, Limited, of Sunderland. The vessel was built to the order of Mr. Francis S. Holland, of London, and was named *Elizabeth Holland*.

Yola.—On March 23rd there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a handsome screw steamer built to the order of Messrs. Elder, Dempster & Co., of Liverpool, for their African line of steamers. The register length of the vessel is 356 ft.; breadth, register, 45 ft. 3 in., and depth, moulded, 29 ft. 4 in., having large top gallant forecastle in which are berthed the sailors and firemen, with lower forecastle on main deck for cattlemen, long bridge amidships under which will be provided stalls, &c., for carrying cattle when in the American trade; the whole of the accommodation for captain, officers, and engineers is built on top of the bridge deck, together with berths for 12 passengers. The handsome saloon is tastefully fitted in polished oak and teak, and complete with every comfort, and the state rooms and saloon are heated throughout by steam. The full poop is entirely devoted to cargo. The vessel is constructed on the deep frame principle, thus dispensing with hold beams, and has cellular water ballast all fore and aft. The poop, bridge, and forecastle decks are of wood, the main and spar decks are of steel; her class will be 100 A1 Lloyds, spar deck grade, special survey, her carrying capacity is 5,750 tons. The deck machinery consists of six large steam winches by Mr. R. Welford, and direct steam windlass by Messrs. Emerson, Walker & Co., Alley & MacLellan's steam steering gear, which is placed in the engine-room and worked from flying bridge, together with all the usual appliances for handling cargo and working the ship with the greatest possible despatch. The main engines are upon the tri-compound principle by the North Eastern Marine Engineering Co., Limited, Wallsend-on-Tyne, and have cylinders 24 in., 40 in., and 64 in., by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 170 lbs. per square inch. During construction the steamer has been inspected on behalf of the owners by Captain Evans, Mr. Lees, and Mr. Hall, and upon leaving the ways was gracefully named the *Yola* by Miss Adam, daughter of Mr. J. B. Adam, of Newcastle-on-Tyne, after which she was towed into the South Dock for the purpose of masting, etc., after which she will proceed to the Tyne for her machinery.

Cassowary.—On March 24th there was launched at Beverley, an iron steam ketch, of about 185 tons gross, named the *Cassowary*, for T. Baskcomb, of Grimsby.

Anglia.—On March 24th Messrs. Wood, Skinner & Co., Limited, launched from their shipyard at Bill Quay-on-Tyne, the second of two steel and iron screw trawlers, which have been built by that firm to the order of Mr. Richard Irvin, Mayor of Tynemouth, for the Irvin Steam Fishing Co., Limited, of North Shields. Her principal dimensions are as follows, viz.:—Length, 93 ft.; breadth, 18 ft. 6 in.; depth, 10 ft. 6 in. She has been built under the special survey of Lloyd's for the 100 A1 trawlers' classification, and will be equipped with all the latest improvements and appliances requisite for the efficient and economical working of vessels of this type. The machinery has been constructed and will be fitted by Messrs. Baird & Barnsley, of North Shields, the engines being of the compound surface condensing type, having cylinders 14 in. and 30 in. diameter respectively, with a stroke of 21 in., supplied with steam by a large steel multitubular boiler of 130 lbs. working pressure. As the vessel was leaving the launchways she was named *Anglia* by Miss Ethel Taylor, of Bill Quay.

Gloriana.—On Friday afternoon, March 25th, there was launched from the west yard of Messrs. C. S. Swan & Hunter, Limited, Wallsend, a steel screw steamer built to the order of Messrs. The British Maritime Trust, Limited, of London. The vessel has been designed to carry a deadweight cargo of 5,600 tons on a moderate draught, or to carry a very large measurement cargo. Her dimensions are:—Length, between perpendicular, 330 ft.; breadth, 45 ft. 3 in., depth, moulded, 28 ft. 9 in. The steamer is built to the highest class at Lloyds on the spar deck rule, under special survey. She has a house aft, long bridge, and topgallant forecastle. On the top of the bridge, in steel houses, is placed the accommodation for the officers, engineers, etc., whilst the crew are located in the forecastle. Water ballast will be carried in the cellular double bottom. Six powerful steam winches are supplied with a full complement of derricks and discharging gear. The steam windlass is of the latest design, whilst a special type of steering gear placed aft, and controlled from the bridge, will be fitted. The machinery is of the latest type of triple-expansion engines, built by the North Eastern Marine Engineering Co., Limited. The cylinders are 24 in., 40 in., and 64 in. diameter, by 42 in. stroke, supplied with steam by two large single-ended boilers, working at a pressure of 170 lb. per square inch. On leaving the ways the steamer was named *Gloriana* by Mrs. R. J. Thompson, wife of the local manager for Messrs. Furness, Withy & Co., Limited.

Despatch.—On March 26th there was launched at Plymouth, an iron steam tug of about 43 tons gross, named the *Despatch*, for Deering & Robottom, of London.

Pointz Castle.—On March 26th there was launched at Hull, for the Castle Steam Trawlers Limited, London, an iron steam ketch, of about 150 tons gross, named the *Pointz Castle*.

Mary.—On March 28th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel towing lighter of the following dimensions:—Length, over all, 97 ft.; beam, moulded, 18 ft.; depth, moulded, 7 ft. 9 in.; and with a carrying capacity of 250 tons. The vessel was built to the order of Messrs. H. Leetham & Sons, corn millers, York, and is the eighth built for that firm. She was christened *Mary* as she left the ways by Miss G. Scarr, daughter of the builder.

Golden Hope and Brederode.—On April 4th Earle's Shipbuilding Co., launched at Hull the steam screw trawlers *Golden Hope* and *Brederode*. The former has been built for Mr. Frank Hazelgrove, Grimsby, and the latter for the Steam Traw Fishing Co., Ymuiden.

General.—On April 6th Messrs. Cochrane & Cooper, launched at Beverley the fifth of nine trawlers being built to the order of the East Coast Steam Fishing Co. The vessel is of the following dimensions:—Length, 112 ft.; beam, 21 ft.; and depth of hold, 11 ft. 6 in. She will be fitted with triple-expansion engines by Messrs. Bailey & Leetham, and was named the *General*.

Khalif.—On April 6th there was successfully launched from the Jarrow yard of Messrs. Palmer's Shipbuilding & Iron Co., Limited, a finely modelled steel screw steamer of the following dimensions:—Length, between perpendiculars, 350 ft.; beam, moulded, 45 ft.; depth, moulded, 28 ft. 6 in. The vessel has been built under special survey to class 100 A1 in Lloyd's register, and is of the three deck type, with poop, bridge, and forecastle. Two complete steel decks are laid extending all fore and aft. The poop is fitted for cargo, and the officers and engineers are berthed on the bridge in large steel deckhouses, and the crew in the forecastle. Water ballast is provided for aft in a cellular bottom and in a deep hold tank amidships. All the necessary requirements to fit the vessel for general and grain cargoes are complied with, and all the most modern improvements for the safe handling of the vessel and rapid loading and discharging of cargo are supplied and fitted throughout. The vessel is designed to load a deadweight of 5,700 tons on about 23 ft. mean draft. The engines, which are also being constructed by the Palmer Co., are of the triple expansion surface condensing type, with cylinders 24 in., 40 in., 64 in. by 45 in. stroke, steam being supplied by two boilers 16 ft. diameter by 11 ft. long, with a working pressure of 160 lbs. The vessel, which is named *Khalif*, has been built under the supervision of Mr. Maxwell Hill, consulting engineer, of Newcastle, and is the last of two building for Messrs. The Bedouin Steam Navigation Co., of Liverpool.

Gallia.—On April 6th there was launched from the shipbuilding yard of Messrs. W. Harkess & Son, Middlesbrough, a steel screw steamer of the following dimensions:—Length, between perpendiculars, 160 ft.; breadth, 26 ft.; depth, 13 ft. She has been built to the order of Messrs. Pile & Co., London, for Svenska Lloyds, of Gotenberg, under the superintendence of Mr. Barkley, of West Hartlepool. She will be fitted with triple-expansion engines of large power by Messrs. Whyte & Mair, Dundee, and will take Lloyd's 100 A1 class. On leaving the ways she was christened *Gallia* by Miss Elsie Harkess, daughter of one of the builders.

Cleopatra.—On April 6th Earle's Shipbuilding Co., Hull, launched the steamship *Cleopatra*, a fine screw steamer built for the Wilson & Furness-Leyland new line of passenger and cargo steamers to run between London and New York and Boston. She is the longest vessel ever built at Hull, her dimensions being—Length, 482ft.; beam, 53 ft., and depth, 34 ft. 6 in., moulded, to upper deck, over which extends a complete shelter deck, and above this a bridge deck 150 ft. long, surmounted by a steel house 130 ft. long and 36 ft. wide. The top of this house is continued to the sides of the ship, and is there supported by stanchions, thus forming a shade deck and a platform for the boats. On top of all another house for the captain and chief officer, and a steering apartment. The whole of the bridge space and the deck house space is appropriated for the accommodation of passengers and officers, and there are berths for 120 first class, a large handsome dining saloon in polished oak with carved panels and pilasters being situated under the bridge deck, while in the house above are a large music room, effectively decorated in ivory colour and gold, a smoking-room in polished oak, and a considerable number of the state-rooms. There will be dining accommodation for 100 persons, and the state-rooms, which are arranged for three passengers on each, have very complete furnishings. The ship has four decks, including the shelter deck, and she is built of steel to Lloyd's highest class on the cellular system of framing, with water ballast all fore and aft, equal to about 1,200 tons, besides a large hold tank abaft the engine space to contain another 1,000 tons. She will have four pole masts fore-and-aft rigged, with ample derrick power and hatches for working the cargo, as well as nine steam winches. She will also have a powerful steam steering gear, by Amos & Smith, amidships, and a Hastie's hand screw gear fitted in a steel house at the stern, with connections to the steering station on the bridge. The whole of the space under the shelter deck will be fitted up for cattle with Wylie's patent fittings and a very complete water service. Cattlemen will also be accommodated here. Steam heating has been adopted throughout, and an efficient installation of electric lighting is to be provided. The ship will be fitted by her builders with a powerful set of triple-expansion 3-crank engines, which will be supplied with steam of 200 lbs. pressure from two double-ended and two single-ended steel boilers, arranged to be worked under forced draught on Howden's system. These, it is expected, will develop upwards of 5,000 I.H.P., and drive the vessel at a speed of 15 knots per hour. The propeller is of manganese bronze, and careful attention has been given in all details of the machinery to ensure the best and most economical results. The ceremony of naming the vessel was gracefully undertaken by Miss Enid Wilson, daughter of C. H. Wilson, Esq., M.P., who was escorted by A. Wilson, Esq., D.L., and by her brother, Mr. C. H. Wellesley Wilson, and the principal officers of the Wilson firm. There were also present Mr. A. E. Seaton, the managing director of Earle's Shipbuilding Co., Mrs. and Miss Seaton, besides the various managers and their ladies and friends.

Masconomo.—On April 6th this vessel was successfully launched by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, and is built to the order of Messrs. T. Hogan & Sons, of Bristol and New York, and is the fourth vessel built by Messrs. Thompson for these owners. She is of the following dimensions—Length, between perpendiculars, 370 ft.; beam, extreme, 48 ft. 6 in.; depth, moulded, 30 ft. She is built to Lloyd's highest class on their spar deck rules, and is fully equipped in every respect for a modern high-class cargo vessel. The propelling machinery has been constructed by Messrs. Blair & Co., Limited, and is designed to work at 200 lbs. pressure. The vessel was gracefully christened by Mrs. Gore, of Bristol, wife of Captain T. H. Gore, the company's superintendent in this country, who has personally supervised the construction of the vessel. After the launch, the company adjourned to the firm's luncheon room, where the usual toasts were duly honoured.

Marselisborg.—On Thursday, April 7th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer, which they have built for C. K. Hansen, Esq., of Copenhagen. She will take Lloyd's highest class, and is of the following dimensions, viz.:—Length, over all, 329 ft.; breadth, 46 ft.; and depth, 23 ft. 6 in. The deck erections consist of a poop, bridge over machinery space, and topgallant forecastle. A handsome saloon and cabins for officers, etc., will be fitted on the bridge. The engineers' rooms are also on the bridge, and the crew's accommodation forward. The hull is built on the deep frame principle, with a cellular double bottom, large hatchways, powerful steam winches, steam steering gear amidships, hand screw gear aft, patent donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel will be supplied. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply triple-expansion engines, having cylinders 23 in., 36¼ in., and 62 in. diameter, with a 39-in. piston stroke, and two large steel boilers to work at 160 lbs. pressure per square inch. The ceremony of christening the steamer *Marselisborg* was gracefully performed by Mrs. Ley Chalton, of West Hartlepool.

Laureldene.—On Thursday afternoon, April 7th, Messrs. Wm. Doxford & Sons, Limited, Sunderland, launched a steel turret deck steamer, which has been built under British Corporation and Bureau Veritas special survey, to the order of Messrs. J. T. Lunn & Co., Newcastle. The principal dimensions of the vessel are 340 ft. by 45 ft. 6 in. by 27 ft. 3 in., the deadweight capacity being 5,600 tons on a light draught. She is fitted with triple-expansion engines, having cylinders 24½ in., 40 in., 66½ in., by 42 in. stroke, and two boilers 13 ft. 3 in. diameter by 11 ft. 6 in. long, all of Messrs. Doxford's make. A special high tank is fitted forward of boiler-room, and is constructed so as to be available for water ballast, cargo, or reserve bunker coals. The deck machinery consists of five steam winches by J. Wigham, steam windlass with capstan forward, by Emerson, Walker, & Co., a special warping steam winch being fitted aft, also of Wigham's make. The donkey boiler is made by Sudroa, and the steam steering gear by Wigham. The launching ceremony took place in the presence of a large number of people, the vessel being christened *Laureldene* by Mrs. J. T. Lunn.

Sapphire.—On April 7th Messrs. John Jones & Sons launched from their shipyard, Brunswick Dock, Liverpool, the paddle steamer *Sapphire*, which is the third vessel built by them for the Eastham Ferry under the supervision and to the specifications and plans of Messrs. Flannery & Tritton, of Liverpool and London, and to the requirements of the British Corporation, with whom the vessel is classed. The vessel is double-ended, and is specially designed for service on the Mersey, her dimensions being 140 ft. by 24 ft. by 8 ft. 6 in. She is fitted with a large cabin, two handsome deck saloons, with large promenade deck above, with seating accommodation for a large number of passengers. The engines are of the diagonal compound surface condensing type, with feathering paddle wheels, and supplied with steam from a large single-ended boiler working at 130 lbs. per square inch. The vessel is fitted up with steam windlass, steam steering gear, a complete installation of electric light, and every latest improvement for the river passenger service.

Mayflower.—On Thursday afternoon, April 7th, the *Mayflower*, the largest vessel that Messrs. Craig, Taylor & Co. have as yet built, was launched from their yard at Thornaby-on-Tees. The dimensions are—372 ft. by 48 ft. by 30 ft. 11 in. depth, moulded. She is of the spar deck type, with poop, bridge, and topgallant forecastle, built of steel to class highest in Lloyd's. This vessel will carry over 7,000 tons, and will be equipped with six large double-powered steam winches, patent direct steam windlass, powerful steam steering gear, a full set of shifting boards for grain certificate, and all the latest improvements. She has water ballast in double cellular bottom fore and aft, also in peaks; she is rigged as a fore-and-aft schooner, with telescopic masts to Manchester Ship Canal requirements. Her engines have been constructed by Messrs. William Allan & Co, Limited, of the Scotia Engine Works, Sunderland, the cylinders being 23½ in., 38½ in., 68 in. by 48 in. stoke, with three boilers working at 200 lbs. pressure. This steamer has been built to the order of Messrs. R. Stewart & Co., Liverpool, and under the superintendence of Mr. C. Macdonald, of Messrs. E. F. Wailes & Co., Newcastle, the owners' consulting engineers. As the vessel left the ways the christening ceremony was gracefully performed by the Mayoress of Thornaby (Mrs. Herbert Taylor), the wife of one of the builders.

Colonial Empire.—On April 7th there was launched at Hull, for the Cargill Steam Trawling Co., Hull, an iron steam ketch of about 162 tons gross, named the *Colonial Empire.*

Admiral Nelson.—On April 7th Messrs. John Blumer & Co. launched at Sunderland the screw steamer *Admiral Nelson*, which has been built to the order of Messrs. Wait & Dodds, of Newcastle-on-Tyne. The vessel is built to the three-deck rule, with wide spaced hold beams, her tonnage on 20 ft. being 5,200 tons. The dimensions of the vessel are:—Length, between perpendiculars, 328 ft.; beam, 47 ft. 9 in.; depth, 24 ft. The engines have been built by Messrs. Blair & Co., Limited, Stockton, and the cylinders are 24 in., 40 in., and 65 in. respectively, with 42 in. stroke, the boiler having a working pressure of 180 lbs.

Pilgrim.—On April 7th Messrs. R. Craggs & Sons launched at Middlesbrough a cargo vessel of the following dimensions:—Length, 374 ft.; breadth, 48 ft.; depth, 30 ft. 10 in. Sir Christopher Furness, Westgarth & Co, Limited, will supply the machinery, and will have cylinders 23½ in., 38½ in., and 63 in. by 48 in. stroke, and steam will be supplied by three large boilers at a working pressure of 200 lbs. per square inch. The vessel has been built to the order of Messrs. Robert Stewart & Co., of Liverpool, under the superintendence of Mr. F. J. Pilcher, as regards both hull and machinery.

Ladas.—On April 7th, there was launched at North Shields a steel steam ketch of about 160 tons gross, named the *Ladas*, for the Orient Steam Fishing Co., Grimsby.

Lysander.—On April 7th there was launched at North Shields a steel steamer ketch, of about 160 tons gross, named the *Lysander*, for the Orient Steam Fishing Co., Grimsby.

Ullapool.—On April 9th Messrs. Pickersgill & Sons launched at Southwick a steel screw steamer. Her dimensions are:—Length, 350 ft.; breadth, 46 ft.; and depth, 28 ft. 2 in; and she has been built under a special survey to take Lloyd's highest class as a spar-decked steamer. Messrs. George Clark, Limited, of Southwick, will supply the machinery, the engines being of the triple-expansion type, having cylinders 24½ in., 40 in. and 66 in. diameter, with 45 in. stroke. During construction the vessel and engines have been under the personal superintendence of Mr. E. H. Bushell, consulting engineer, of Liverpool. The vessel is built to the order of Messrs. Japp & Kirby, Liverpool, and was named *Ullapool.*

Tuscarora.—On April 9th Sir James Laing launched from his yard at Deptford, Sunderland, a vessel said to be the largest oil steamer afloat. The dimensions are:—Length, 437 ft.; breadth, 53 ft.; depth to upper deck, 32 ft. 6 in., with shade deck fitted over upper deck, all fore and aft, 7 ft. 3 in. high. It is designed to carry 7,000 tons of petroleum oil in bulk in 10 thwartship tanks, divided by oil-tight longitudinal centre bulkhead, a continuous trunk 23 ft. wide being fitted between oil and upper decks to allow for expansion. In addition to above there is bunker space at sides of engines and boilers, together with large cross bunker forward of boiler-room, for 1,000 tons of coals. The engines and boilers, which are supplied by Messrs. John Dickinson, of Palmer's Hill Engine Works, are of the triple-expansion type, with cylinders 29 in., 48 in., and 78 in., with 54 in. stroke. During construction the vessel has been superintended by Mr. J. Morton and J. M'Ewan, the company's engineers and ship surveyors. The vessel has been built to the order of the Anglo-American Oil Co., and was named *Tuscarora.*

Victorious.—On April 13th Messrs. R. Stephenson & Co., Limited, launched at Hebburn-on-Tyne a steel cargo steamer of the following dimensions:—Length, 330 ft.; breadth, 46 ft.; and depth, 28 ft. 3 in. She has a cellular double bottom throughout and after peak tank for water ballast, and holds sub-divided with extra bulkheads for carrying grain. The engines, which are of the triple-expansion type, with cylinders 24 in., 40 in. and 66 in. by 45 in. stroke, with two large single-ended boilers, working at 170 lbs. pressure, are to be supplied by Messrs. Blair, of Stockton. The vessel, built to the order of Messrs. Macintye Bros. & Co., of London and Newcastle, was named the *Victorious* by Miss Macintyre, daughter of the managing owner.

Asia.—On April 18th there was launched from the Walker shipyard of Sir W. G. Armstrong, Whitworth & Co. a steel screw steamer of the following dimensions:—Length, 238 ft.; breadth, 32 ft.: depth, 18 ft. She is capable of carrying about 1,200 tons. The vessel will be fitted with machinery by the Wallsend Slipway and Engineering Co., which will give her a speed of 11 knots loaded. Special attention has been given to design of the vessel in order that she might pass through the locks of the Marinsky Canal system. She was named *Asia*, and is intended for the carriage of petroleum in bulk on the Caspian Sea.

Harrington.—On April 19th Messrs. Austin & Son launched at Sunderland the steel well-deck screw steamer *Harrington*. The vessel's dimensions are: —Length, 268 ft.; breadth, 37 ft. 7 in.; depth, moulded, 19 ft. 9 in. She will be classed 100 A1 in Lloyd's Register under special survey, and carry about 2,600 tons deadweight. The machinery is to be supplied by Messrs. George Clark, Limited, and will be of the tri-compound type. She has been constructed to the order of Messrs. J. & C. Harrison, of London, Newcastle, Cardiff, &c.

Loraine.—On April 20th Messrs. Wood, Skinner & Co., Limited, launched from their shipbuilding yard at Bill Quay-on-Tyne, a handsome new steel screw steamer, which has been built to the order of Messrs. Henry Scholefield & Son, of Newcastle-on-Tyne. The vessel is a fine specimen of a modern cargo steamer, of the improved single-deck type, with poop, long bridge, and topgallant forecastle, and is of the following dimensions, viz.:—Length, over all, 338 ft.; breadth, 48 ft 6 in.; depth, moulded, 24 ft. The vessel has water ballast in the cellular double bottom all fore-and-aft. She will be rigged as a fore-and-aft schooner, with fidded topmasts, and will be equipped with all the most modern improvements and appliances for facilitating the rapid loading and discharging of cargo and the general working of the vessel. She is constructed to carry 5,100 tons on about 20 ft. 6 in. draught, and has been built under the special survey of Lloyd's for their 100 A1 classification. The saloon, captain's accommodation, and spare berths are in a large house on bridge deck amidships; chart-room on flying bridge above; the officers' accommodation being in side-houses also on bridge deck; while the crew are berthed in the forecastle. The vessel will be fitted with a set of triple-expansion engines of the improved type, having cylinders 23½ in., 39 in. and 64 in. diameter respectively, with a stroke of 42 in, steam being supplied by two large steel multitubular boilers, working at 160 lbs. pressure per square inch. The machinery has been constructed and will be fitted by the North-Eastern Marine Engineering Co., Limited, at the Northumberland Engine Works, Wallsend. The ceremony of christening the vessel was performed by Miss Lily Scholefield, daughter of Mr. H. E. Scholefield, of Liverpool, who named the steamer *Loraine.*

Edenmoor.—On April 20th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a steamer of the following dimensions:—326 ft. by 47 ft. by 26 ft. 4½ in. depth, moulded; deadweight capacity, 5,500 tons on a light draught. Her engines have cylinders of 24 in., 40 in., and 64 in. by 42 in. stroke, with two large steel boilers, working at a pressure of 160 lbs. per square inch. The vessel has been built to the order of Messrs. Walter Runciman & Co., of Newcastle-on-Tyne. Miss Elsie Readhead. daughter of Mr. James Readhead, named the vessel *Edenmoor*.

Enero.—On Wednesday, April 20th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer of the following dimensions, viz.:—Length, 290 ft.; breadth, 43 ft.; depth, 22 ft., and to class 100 A1 at Lloyd's on the partial awning deck rule. This vessel has water ballast fitted right fore-and-aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including four double cylindered, steam winches, direct acting steam windlass, large donkey boiler, steam steering gear by Messrs. Hastie & Co., and Hastie's screw gear aft. The engines which are to be supplied by Messrs. North Eastern Marine Engineering Co., Limited, are of the triple-expansion type, having cylinders 22½ in., 37 in., and 61 in. by 39 in. stroke and working at a pressure of 160 lbs. On leaving the ways the vessel was named the *Enero* by Miss Wadworth, of Manchester.

William Broadley.—On Wednesday, April 20th, the Red "R" Steamship Co., Limited, of Newcastle (Messrs. Stephens and Mawson managers) added another large steamer to their fleet. This vessel, which was launched from the shipbuilding and repairing works of the Blyth Shipbuilding Co., Limited, of Blyth, is a steel screw steamer to carry a large cargo on a light draft of water. The principal dimensions of the vessel are:—Length, 337 ft.; breadth, 47 ft.; depth, 24 ft., 10 in., with poop for cabins, bridge amidships under which the engineers' cabins will be fitted, and a topgallant forecastle for crew. The vessel is classed at Lloyd's, and is built on the three-deck principle with single deck laid and deep framing, but no hold beams, thus giving a very large area in the holds for stowing cargoes of the bulkiest description. The engines will be fitted by Messrs. Blair & Co., Limited, of Stockton-on-Tees, and are of the triple expansion type, of large power, and fitted with all their latest improvements for the easy working of machinery and economy in fuel. As the vessel left the ways, the ceremony of naming her *William Broadley* was gracefully performed by Miss Broadley, of Southport. The hull and engines have been built under the superintendence of Mr. Cowen Landreth, consulting engineer, of Newcastle-on-Tyne.

Juno.—On Thursday, April 21st, Messrs. Wigham Richardson & Co. launched from their Neptune Shipyard, Newcastle-on-Tyne, a finely modelled steel screw steamer which they are building to the order of the Russian Steam Navigation and Trading Co., of Odessa. The vessel is 357 ft. long by 46 ft. beam, and will be fitted by Messrs. Wigham Richardson & Co. with engines and boilers designed to drive her at a good speed —10 knots fully loaded. The arrangements for working the ship herself, and for loading and discharging the cargo are of the most modern and improved description. The owners were represented at the launch by Mr. W. Nevins, under whose superintendence the vessel is being constructed. As the vessel left the ways she was named the *Juno*, the christening ceremony being gracefully performed by Miss Mary Hancock Thomson, of Newcastle-on-Tyne, niece of Lord Kelvin.

Dromore.—On Thursday, April 21st, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions:—Length, over all, 342 ft.; breadth, extreme, 46 ft.; depth, moulded, 26 ft. 9 in.; tonnage, gross, 3,220 tons. This vessel, which has been built to the order of Messrs. W. Johnston & Co., Limited, of Liverpool, will class 100A1 at Lloyd's under special survey. She is of the single-deck type, with short poop aft, long bridge amidships, with engineers' accommodation in after end, captain and officers being berthed in a large house on bridge deck, and crew in topgallant forecastle. A cellular double bottom throughout, and peaks are fitted for water ballast, and equipment includes six steam winches, multitubular donkey boiler by Messrs. Blair & Co., steam windlass, stockless anchors, steam steering gear, double derricks to all hatches, etc. The engines, by Messrs. Blair & Co., Limited, are triple-expansion, having cylinders 22½ in., 39½ in., and 67 in. by 42 in. stroke., steam being supplied by two single-ended boilers with a working pressure of 200 lbs. The vessel was named *Dromore*.

Sampo.—On April 21st Sir W. G. Armstrong, Whitworth & Co. launched from their Walker shipyard a vessel which, although of small size, possesses, nevertheless, unusual interest. The vessel is an icebreaker, very few of which have so far been constructed in this country, and she is designed on a principle as to which the following particulars have been furnished:—"The earlier icebreakers were designed with a long cutaway bow, so that in working among ice the vessel was steered directly against the ice which it was desired to break, and the contour of the bow enabled her to slide some distance up on to the ice. If the ice was not too thick it gave way under the vessel's weight, and the manœuvre was repeated, with the result that in time, by dint of repeated attacks, a lane was cut through the ice. The efficiency of such a vessel is obviously exceedingly limited, and was not nearly sufficient to satisfy the exigencies of modern commerce in ice-bound ports. This icebreaker is constructed on a very different principle. One propeller is arranged aft, in the usual position, and another smaller propeller forward. This forward propeller, by giving to the water under the ice a high sternward velocity, deprives the ice of its support, which naturally reduces its resistance to crushing, so that the advancing bow of the vessel, which is arranged with a suitable overhang, cuts its way into the unsupported ice without experiencing either the shock or the resistance to which the former type of icebreaker was constantly exposed, and very often failed to overcome." The boat is of the following dimensions:—Length, 202 ft.; breadth, 43 ft.; depth, 21 ft. 9 in. She will be fitted with two sets of triple-expansion engines which have, of course, to be of special construction to fit them for the arduous service which they will undergo. The vessel has been constructed for the Imperial Senate for Finland, and will be principally used in keeping the port of Hango open during the winter. The launching ceremony was performed by Madame Brunner, wife of the Russian Consul in Newcastle, who named the vessel *Sampo*.

Tenby.—On April 21st Messrs. Ropner & Son launched at Stockton-on-Tees a steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 336 ft. 6 in.; breadth, extreme, 46 ft. 6 in.; depth, moulded, 27 ft. 3 in. The steamer has been built to the order of Messrs. R. Ropner & Co., West Hartlepool, and is of the three-decked rule, fitted with the builders' patent trunk, full poop, bridge, and topgallant forecastle. She has double bottom on the cellular principle for water ballast, and will carry about 5,925 tons on Lloyd's summer freeboard. She will be fitted with a set of powerful triple-expansion engines by Messrs. Blair & Co., Limited. The christening ceremony was performed by Mrs. W. Ropner, who gave her the name of *Tenby*.

Iron Lighter.—On April 23rd there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, an iron lighter of the following dimensions:—Length, over all, 70 ft.; depth, 18 ft. 6 in.; beam, moulded, 9 ft. She was built to the order of Messrs. Thomas Wilson, Sons & Co., Limited, Hull, and is the sixteenth Mr. Scarr has built for that firm.

Nippon Maru.—On April 23rd there was launched from Sir James Laing's yard at Sunderland a twin-screw mail and passenger steamer. She is one of three steamers built to the order of Messrs. M. Samuel & Co., of London, on behalf of the Toyo Kisen Kabieshiki Kaisha of Tokio, for inaugurating a new fast service between China, Japan, and the United States, and, although not primarily intended for fighting purposes, the high speed and general arrangements of these vessels are such as would render them easily adaptable for cruisers or despatch boats in the event of war. Each of the vessels is 442 ft. long over all, by 50½ ft. beam, by 32½ ft. deep, and capable of a speed of 17 knots, the engines being twin-screw triple-expansion of 7,500 I.H.P. The passenger accommodation includes suites of rooms containing night and day cabins, besides the ordinary accommodation for first and second class passengers and emigrants. The officers and engineers are berthed partly on the main deck, the upper deck and its accommodation being reserved chiefly for the passengers. The saloon is sufficiently large for all the first-class passengers to be seated at dinner at one time. Electric light, special heating arrangements for cold weather and ventilation for the hot season, refrigerating machinery for fresh provisions, and all other usual auxiliary machinery, including that necessary for the handling of express cargo, mails, and passengers' baggage are provided.

Bronze propellers and steel are used in the construction of the engines as far as possible. The vessel was named *Nippon Maru*.

Messrs. G. Rennie & Co., of Greenwich Iron Ship Building Yard, Thames Street, Greenwich, launched during the month the following vessels:—A steel towing lighter, *Norwegian*, 170 tons; steel screw tug *Velox*, owners, Messrs. Vokins & Co., London; steel screw tug, *Margaret*, owners, Thames Tug and Lighterage Co., Limited; steel sailing barge *Arctic*, 165 tons; steel towing lighter, *Gascon*, 170 tons; steel towing lighter, *Circassian*, 170 tons; and a steel barge, *John*, 110 tons.

LAUNCHES—Scotch.

Simla.—On March 10th there was launched at Renfrew for Mr. W. Watkins, of London, a steel steam tug, of about 150 tons gross, named the *Simla*.

Regele Carol I.—On March 22nd there was launched at Glasgow for the Roumanian State Railways, of Kustendje, a steel steamer, of about 2,600 tons gross, named the *Regele Carol I*.

Hebrides.—On March 24th the Ailsa Shipbuilding Co., Troon, launched from their yard a steel screw steamer, built for Messrs. John M'Callum & Co., Glasgow, for their West Highland trade. Her dimensions are as follows:—Length, over all, 190 ft.; length between perpendiculars, 180 ft.; breadth, moulded, 28 ft.; depth, moulded, 18 ft. 10 in. She has been built to the design of Mr. G. L. Watson, Glasgow, under special survey at Lloyd's for 100 A1 class, and to Board of Trade requirements for passenger certificate. The machinery is being fitted by Messrs. A. & J. Inglis, Glasgow, the engines being triple-expansion, with cylinders 16 in. 26 in., and 42 in. diameter, with a piston stroke of 30 in. The vessel will be completed in the very best style, with steam steering gear, steam winches, steam windlass, electric light, and every modern convenience for the accommodation and comfort of passengers, the quick handling of cargo, and the safe transport of cattle. On leaving the ways she was gracefully named *Hebrides* by Miss Ross, 4, Eton Gardens, Hillhead, Glasgow.

Ula.—On March 24th Messrs. Wm. Denny & Bros., Dumbarton, launched the screw steamer *Ula*, of 5,300 tons gross, and built to the order of the British India Steam Navigation Co. The machinery will be supplied by Messrs. Denny & Co. The launching ceremony was performed by Mrs. Ward, wife of Mr. John Ward, one of the partners of the firm. The *Ula* is a sister ship to the *Umballa* and *Ujina*, recently built by the Messrs. Denny for the same company.

Princess Ena.—On March 25th there was launched from the Caledon Shipbuilding and Engineering Co.'s yard, Dundee, a screw steamer built to the order of Messrs. M. Langlands & Sons, Liverpool and Glasgow. Her dimensions are:—210 ft. long, 29 ft. 2 in. broad, and depth, 12 ft. 10 in., her gross tonnage being 700 tons. As the vessel left the ways she was christened *Princess Ena* by Miss Vassie, Crofton Hall, Lanark.

Vega.—On March 26th there was launched from the yard of Messrs. Murdoch & Murray, Port-Glasgow, a finely modelled steel screw steamer of the following dimensions:—Length, 200 ft.; breadth, 30 ft.; depth, 19 ft. The vessel has been built for passenger and cargo service on the Gulf of Finland, for Messrs. The Wasa Nordsjo Angbats Aktiebolag, and is well fitted out in every respect. The passengers are berthed amidships, the dining saloon being in a house on the upper deck. There is also a large poop space for emigrants. This is the fourth vessel built by Messrs. Murdoch & Murray for the same owners. On leaving the ways the vessel was named *Vega* by Miss Alice Smith, Greenock. Messrs. Rankin & Blackmore will supply triple-expansion engines of large power. During construction the vessel has been superintended by Captain Wilhelm Roos, Helsingfors, whilst the machinery has been surveyed by Mr. George S. Horne, Glasgow.

Malaya.—On March 26th, Messrs. William Hamilton & Co., launched from their Glen Yard, Port-Glasgow, a screw-steamer for the East Asiatic Co., Limited, of Copenhagen, for their eastern trade. The following are the principal dimensions:—length over all, 385 ft.; length between perpendiculars, 370 ft.; breadth, 46 ft. 6 in.; depth moulded. 29 ft.; gross tonnage, 4,200 tons; and the vessel is designed to carry 6,000 tons deadweight on Board of Trade freeboard. The vessel has full poop, long bridge deck, and topgallant forecastle. Accommodation for about 20 first-class passengers is provided for in large deck-house on top of bridge deck. The state-rooms are large and airy, and are replete with every comfort for travelling in a hot climate. Refrigerating plant and cold chambers are supplied by Messrs. Haslem, of Derby, so that a continued supply of fresh provisions may be had. The vessel is fitted with a complete installation of electric light, including cargo clusters, arc lamp and large search-light for use in navigating the Suez Canal. The accommodation for the officers and crew is of the most complete description. The captain's room, chart-house, and a handsomely-fitted-up state-room for use of the directors of the company, are placed in large deck-house on top of shade deck, with navigating bridge overhead. The officers and engineers are placed in houses on bridge deck, and are fitted with every requisite, while the crew are berthed under the topgallant forecastle. The *Malaya* has been built to the highest class at Lloyd's on the deep frame system, and is fitted throughout with cellular double bottom for water ballast, the afterpeak being utilized for this purpose as well as for fresh water for use when carrying coolies in the east. All the newest requirements for the quick loading and discharging and working of the ship have been supplied, including eight steam winches and derricks, steam windlass, steam steering gear, &c. The machinery, which is being supplied by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system, the cylinders being 25 in., 42 in., and 63 in. diameter by 45 in. stroke, steam being supplied by three large boilers working at 160 lb. pressure. As the vessel left the ways she was gracefully named the *Malaya* by Mrs. J. Cairns, of Kirkcaldy. The owners were represented at the launch by Captain C. Schmiegelow (who has superintended the construction of the vessel), Captain Baerenzen (who is to command the vessel), Mr. J. Cairns, and Mr. Lasson, the chief engineer.

Orion, Niobe and Apollo.—On March 29th Messrs. Mackie & Thomson, Govan, launched the steam trawlers *Orion*, *Niobe* and *Apollo*, which they have built for the Orion Steam Fishing Co., Limited, Grimsby. The dimensions of each are:—Length, 100 ft.; breadth, 20 ft. 6 in.; depth, moulded, 11 ft. 7 in.; tonnage, 160 tons gross. Triple-expansion engines of 250 I.H.P., with boilers constructed for a working pressure of 170 lbs., will be supplied by Messrs. Ross & Duncan, Govan. The vessels, which were named by Mrs. Mackie, Miss Mackie, and Mrs. Wylie, Kilmarnock, are the first of a new fleet which the Orion Co. are acquiring, and are fitted out in the most complete manner for the North Sea fishing industry.

Futami Maru.—On April 3rd Messrs. R. Napier & Sons, Limited, launched from their shipyard at Govan, the second of three steel screw steamers of about 3,300 tons which they are building for the Nippon Yusen Kaisha (Japan Mail Steamship Co. These fine steamers have been designed to meet the requirements of the company's Australian service, and are built under special survey to Lloyd's three-deck class, and fitted in accordance with the Japan Government rules and British Board of Trade requirements. The general dimensions are:—Length, 375 ft.; breadth, 44 ft.; depth, 27 ft. 8 in.; with a topgallant forecastle, long bridge, full poop, and partial shade deck, and constructed with a cellular double bottom for water ballast. The upper decks and fittings are of teak, and the most modern appliances have been supplied for the efficient working of ship and the rapid handling of cargo. As the vessel moved down the ways Mrs. George M'Farlane named her the *Futami Maru*, and, after a very successful launch, the steamer was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Engine Work.

Abeille XI.—On April 4th there was launched at Renfrew a steel steam tug, of about 400 tons gross, named the *Abeille XI*.

Yorkshire.—On April 5th there was launched at Aberdeen a steel steamer of about 179 tons gross, named the *Yorkshire*.

Rutherglen.—On April 5th Messrs. A. Rodger & Co., Port-Glasgow, launched a steel screw-steamer for Messrs. Maclay & M'Intyre, Glasgow. Dimensions:—Length, 314 ft.; breadth, 44 ft.; depth, 23 ft. 3 in. moulded. The steamer registers 2,560 tons gross, and will carry 4,300 tons deadweight. The machinery will be supplied by Messrs. Hall-Brown, Buttery & Co., Glasgow. The ceremony of naming the steamer *Rutherglen* was performed by Mrs. Joseph Maclay, of Park Terrace, Crosshill.

Nightingale.—On April 6th Mr. James Miller launched at St. Monan's, a fishing boat, built to the order of Mr. Robert Dunn, St. Monan's, and named the *Nightingale.* The *Nigntingale* is to be fitted up immediately to proceed to the cod-fishing in the North Sea, and is 67 ft. over all.

Maria de Larrinaga—On April 6th Messrs. Charles Connell & Co., Whiteinch, launched the steel screw steamer *Maria de Larrinaga*, built to Lloyd's highest class, for Messrs. Larrinaga & Co., Liverpool. Her dimensions are:—Length, 365 ft.; breadth, 47 ft. 1 in.; depth moulded, 29 ft. 4 in., with a deadweight capacity of about 6,300 tons. Her machinery is being constructed by Messrs. Dunsmuir & Jackson, Govan.

Glencoe.—On April 6th Messrs. Irvine's Shipbuilding and Dry Docks Co., Limited, launched a handsomely modelled steel screw steamer of 4,250 tons deadweight carrying capacity on Lloyd's summer freeboard. This vessel has been built to the order of Messrs. Livingston, Conner & Co., of West Hartlepool, and is classed to Lloyd's highest class, built under special survey, and is of the following dimensions—313 ft. by 44 ft. by 23 ft. ½ in., having poop, bridge, and topgallant forecastle, cellular double bottom for water ballast, all fore and aft, and in the after-peak. Special regard has been paid for dealing with rapid loading and discharging of cargoes, for which extra large hatchways have been fitted with powerful winches of the company's own make, and double derricks to each hatch, together with all the latest improvements in the entire outfit of the vessel, including steam steering gear, improved steam windlass, etc. The boats will be placed on a platform deck overhead. The engines are of the triple-expansion type, and will be supplied by Messrs. Blair & Co., Limited, Stockton-on-Tees. As the vessel left the ways the christening ceremony was gracefully performed by Miss Gertrude Elmes, of Coleswood, Harpenden, Herts, who named the ship *Glencoe.* The hull and machinery have been built under the personal supervision of Captain Conner and Mr. Swaddle, the owners' superintendent.

Kwang Ping.—On April 6th there was launched from the shipyard of Messrs. John Scott & Co., Abdem Works, Kinghorn, a steel screw-steamer of the following dimensions:—275 ft. by 40 ft. by 22 ft., with a gross tonnage of 1,967 tons, and carrying 2,000 tons deadweight on 14 ft. draught. The vessel is intended for the Chinese Engineering and Mining Co., of Tientsin, China. She is equipped with every comfort for the accommodation of 208 passengers (European and native), is fitted throughout with electric light, and has all the latest improvements for the speedy loading and discharging of cargo. She has been built under the supervision of Captain Calder, representative of the owners in this country, and is to the highest class of the British Corporation. The engines are of the triple expansion type, with cylinders 20 in., 32 in. and 54 in by 36 in. stroke, and two boilers 14 ft. 6 in. by 10 ft. 6 in. 170 lbs. working pressure, and were also constructed by Messrs. Scott & Co., and have all the latest appliances for economic working. The construction of the engines was superintended by Mr. Albrecht, superintendent engineer of the company. The vessel, on leaving the ways, was gracefully christened the *Kwang Ping* by Mrs. Calder, wife of the superintendent.

Eagle.—On April 6th Messrs. Gourlay Brothers & Co. launched at Dundee a steel saloon deck paddle steamer, which they have built to the order of the General Steam Navigation Co., London. The vessel has been specially designed for the large passenger traffic on the River Thames, and is fitted with all the latest improvements in hull and engines which the long experience of the owners has suggested. She has been built to Board of Trade requirements for passenger certificate, and is 265 ft. long between perpendiculars, 30 ft. broad, and 10 ft. 6 in. in depth, gross tonnage 620 tons. She is intended to have a high rate of speed, the engines being compound diagonal surface-condensing, steel being mostly used in construction. Steam is to be supplied by two large boilers fitted with forced draught and all latest improvements. The vessel was named the *Eagle* as she left the ways, the christening ceremony being performed by Mrs. Preston, wife of the superintendent engineer to the company.

Julius Holmblad.—On April 7th Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel screw steamer of about 1,400 tons gross register, and to carry 2,200 tons deadweight, for Det Danske Kulkompagni, of Copenhagen. The vessel has been specially built for the coal trade between Copenhagen and Grangemouth, and is fitted with large self-feeding hatches, so that the cargo can all be loaded without trimming. The vessel has been built largely in excess of Lloyd's 100A1 requirements, with angle bulb frames, and the plating is doubled and internally strengthened forward to prevent damage from contact with ice in the Baltic. The following are the principal dimensions:—Length between perpendiculars, 250 ft.; breadth, 36 ft.; depth, moulded, 19 ft. A long bridge deck is fitted with accommodation underneath for dining saloon, captain, and officers. The crew are berthed under topgallant forecastle, with a hood aft over steering gear. The vessel is fitted with steam steering gear, steam windlass, and steam winches for warping only. Electric light has been fitted on board, with large clusters for use at night when working cargo in port. The machinery, which is being supplied by Messrs. Blackwood & Gordon, of Port-Glasgow, is on the triple-expansion system, the cylinders being 18 in., 29 in., and 47 in. diameter by 33 in. stroke, steam being supplied by a large boiler at 165 lb. pressure. As the vessel left the ways she was gracefully named the *Julius Holmblad* by Miss Harvey of Benclutha.

Yarmouth Belle.—On April 7th a new passenger steamer was launched by Messrs. W. Denny & Brothers, at Dumbarton, for the Belle Steamers Co. The vessel, which will be ready to commence running on the Thames in June, is intended to complete the daily service of steamers inaugurated last season from Fresh Wharf, London Bridge, to Yarmouth direct, and will run in conjunction with the *Walton Belle*, one boat down and up each day, leaving Yarmouth and Fresh Wharf respectively at 9.30, without changing at Clacton. The steamer was christened the *Yarmouth Belle* by Mrs. Cave, wife of Colonel Cave, one of the directors of the company.

Kuikiang.—On April 7th Messrs. Scott & Co., shipbuilders, Greenock, launched the steel screw steamer *Kuikiang* for the China Navigation Co., Limited. The *Kuikiang*, which is the third of a fleet of six building by Messrs. Scott for the same company, is 275 ft. long, 38 ft. broad, 22 ft. 6 in. deep, and is 2,100 tons gross, with a carrying capacity of 2,700 tons. She will be engined by her builders, the engines being triple-expansion, cylinders 20 in., 32 in. and 52 in. respectively, by 39 in. stroke.

H.M.S Hermes.—On April 7th there was launched from the yard of the Fairfield Shipbuilding and Engineering Co., Limited, Govan, H.M.S. *Hermes*, a second-class protected cruiser of the improved *Juno* class of vessels recently delivered to the Admiralty, two of which, the *Venus* and *Diana*, were built by the Fairfield Co. The *Hermes* is one of three vessels ordered by the Admiralty in December, 1896, to be built in private yards, and of these the *Hermes* and *Highflyer* were ordered from Fairfield. The principal dimensions are:—Length, between perpendiculars, 350 ft.; breadth, extreme, 54 ft.; and displacement, 5,600 tons. The hull is built of Siemens-Martin steel throughout, to Admiralty requirements, on the usual principle adopted in warship construction. There is a cellular bottom extending the full length of the engine and boiler spaces. The vessel being intended for foreign service and long cruises at sea, in which the maintenance of a uniform speed becomes essential, she has been completely covered to above the load waterline with teak of the minimum thickness of 3½ in., and coppered. She will be propelled by two sets of four-cylinder triple-expansion engines in separate engine-rooms. The high pressure cylinders are 26 in. diameter, the intermediate pressure cylinders 42 in. diameter, and each of the four lowpressure cylinders 48 in. diameter, with a stroke of 2 ft. 6 in. Steam is supplied by eighteen Belleville water-tube boilers of the latest type, fitted with economisers, and adapted for a working pressure of 300 lbs. The contract speed is 20 knots.

Isis.—On April 9th Messrs. Caird & Co., launched at Greenock the steamer *Isis* for the Peninsular and Oriental Steam Navigation Co. The new vessel is of the following dimensions:—Length, 300 ft.; breadth:—37 ft.; and depth, 18½ ft.; and of 1,800 tons gross. She is intended for the service between Brindisi and Port Said, and has accommodation for 78 first-class passengers. She will be fitted with engines and twin screws capable of driving her over 22 knots an hour. The naming ceremony was performed by Miss Elsie Caird, daughter of Mr. Patrick Caird.

Augusta.—On April 11th, a large steam trawler built to the order of the Societe Anonyme des Chantiers a Vapeur, Ghent, was launched from the shipbuilding yard of Messrs. John Duthie, Sons & Co., Aberdeen. Her dimensions are:—Length, 120 ft.; breadth, 20 ft. 6 in.; depth, 12 ft. As the vessel left the ways she was named *Augusta*.

Queensborough and Rochester.—On April 12th Messrs. Mackie & Thomson, Govan, launched the two steam fleeters *Queensborough* and *Rochester*, which they have built for Messrs. Hagerup, Doughty & Co., Grimsby. The vessels are of 160 tons each, and will be engined by Messrs. Muir & Houston.

Suecia.—On April 13th Messrs. Blackwood & Gordon, engineers and shipbuilders, Port-Glasgow, launched a steel screw-steamer for Svenska Lloyd, Gothenburg. Dimensions:—Length, 205 ft.; breadth, 31 ft. 6 in.; depth, 16 ft. 4 in. The machinery will be supplied by the builders, and will be triple-expansion of 17 in., 27 in., and 44 in. by 30 in. stroke. The steamer was named *Suecia* by Mrs. F. P. Purvis.

Steel Sailing Barque—On April 14th Messrs. Russell & Co. launched at Port-Glasgow a three-masted steel sailing barque, of about 1,500 tons net register. Dimensions:—246 ft. by 37 ft. 6 in. by 22 ft. 6 in., with a deadweight capacity of 2,800 tons. She will receive the 100A1 highest class at Lloyd's. This vessel has been built on builders' account, and is for sale.

Natuna.—On Saturday, April 16th, the steel twin-screw steamer *Natuna* was launched by Messrs. Ramage & Ferguson, Limited, Leith, for the East Asiatic Co., Limited, of Copenhagen. This vessel, which has been specially designed for local service at Bangkok, and the Gulf of Siam, is intended to work in conjunction with the regular line of large steamers which has recently inaugurated a new passenger and cargo service to trade regularly between Copenhagen, Antwerp, and other continental ports and the far East. In order to be able to cross the bar at the mouth of the Bangkok river, a light draught of water is provided for, along with great cargo capacity, while passenger accommodation of an elegant description is arranged in a large bridge amidships, fitted up with every convenience for comfort in a tropical climate. The principal dimensions of the *Natuna* are:—Length over all, 208 ft. 6 in.; breadth, 32 ft.; and depth, moulded, 13 ft. 6 in.; with raised quarter-deck, bridge, and topgallant forecastle, all having teak decks. Powerful steam winches suitable for handling teak logs and other heavy weights are placed at each hatch, and steam windlass and steam steering gear are also fitted. High pressure compound twin engines of 600 I.H.P. propel the steamer, steam being supplied from a large steel boiler, and all the latest improvements are supplied. The *Natuna* is intended to sail direct from Leith to Bangkok in a few weeks with a full cargo of valuable machinery on board.

Pollux.—On April 20th the Campbeltown Shipbuilding Company successfully launched from their yard at Trench Point the second of two steel screw-steamers recently purchased by a Russian firm of shipowners. The vessel, which has been built to the highest class of Lloyd's, is of 1,950 tons deadweight, and is of the following dimensions:—Length, 238 ft. 6 in.; breadth, 32 ft. 8 in.; depth, moulded, 17 ft. 6 in. Triple-expansion engines will be supplied by Messrs. Kincaid & Co., Greenock. On leaving the ways the steamer was named *Pollux* by Miss Thomson, Gowanbank, Campbeltown.

T. E. Fuller—On April 20th Messrs. David J. Dunlop & Co., engineers and shipbuilders, Inch Works, Port-Glasgow, launched from their works, a handsomely modelled steel twin-screw steamer of 1,500 I.H.P., for specially heavy towing work at Table Bay Harbour, Cape Town, to the order of the Colonial Government. The dimensions of the vessel are:—Length, between perpendiculars, 135 ft.; breadth, moulded, 26 ft.; depth, moulded, 14 ft. Built to Lloyd's 100 A1 class, and under their special survey. The engines are of the triple-expansion type, having two sets of cylinders 14 in. 22 in., and 36 in., diameter, by 24 in. length of stroke, and two large single-ended boilers. The steamer will be specially fitted out by the builders, and her outfit will include a powerful steam fire pump, complete electric light installation, with a search-light of 20,000 candle power, bronze propellers, teak decks, double awnings, two spare anchors (Hall's patent stockless) 45 cwt. each, galvanized tanks for 50 tons fresh water in 12 separate compartments, with all connections complete, two pole masts, etc. As the vessel left the ways she was gracefully named *T. E. Fuller* by Miss Sommerville, Aldergrove, Port-Glasgow.

William Price.—On April 22nd Messrs. Wm. Simons & Co., Limited, Renfrew, launched complete with all machinery on board, and with steam up ready for work, one of the largest and most powerful hopper dredgers that they have yet constructed. This vessel, which is built to Lloyd's highest class for a vessel of this type, is of the following dimensions:—Length, 236 ft., breadth, 43 ft. 6 in.; depth, 16 ft., and has a hopper capacity to carry 1,250 tons of dredgings. The bucket ladder is made of sufficient length to dredge to 43 ft. depth of water when hopper is empty. Two sets of buckets have been provided, one set to dredge in soft ground, having each a capacity of about 23 cubic feet. The other set is made of special design and great strength to dredge hard material, and are each about 12 cubic feet capacity. All the woodwork throughout the vessel is of teak. Ample accommodation is provided for officers and crew in separate cabins on either side of the bucket well. Two sets of steering gear are provided. The vessel is propelled by two sets of triple expansion engines of about 1,500 I.H.P., which will steam her at the rate of 10 knots per hour when loaded. Either set of engines can be used for dredging, and change gear is provided to work in hard and soft ground. Two main boilers are supplied, constructed to Lloyd's requirements for 160 lbs. working pressure. A donkey boiler is also provided. Besides the usual duplex feed and bilge pumps, a large special pump is provided for salvage purposes. Independent two-cylinder steam winches are fitted at bow and stern for manœuvring the vessel when at work; also independent steam hoisting gear for raising and lowering the bucket ladder, and independent engines for raising the hopper doors and working the side shoots to fill hopper barges when required. The vessel has been constructed for the Karachi Port Trust, under the direction of the engineers, Messrs. D. Morris and Edward Jackson, M.I.C.E., and is named *William Price*, in honour of Mr. William H. Price, now consulting engineer, and previously for 30 years engineer for the harbour at Karachi, first under the Government and then the Port Trust. The naming ceremony was gracefully performed by Miss Hetty Jackson, daughter of Mr. Edward Jackson, of London. The trials of this vessel will take place in a few days. The vacant berth in the yard will be occupied by the second of two powerful twin-screw hopper steamers for the Thames Conservancy. The other vessels under construction in the yard are also a hopper steamer for the Thames, four duplicate twin-screw bucket dredgers for the Russian Government for the Black Sea and Baltic Ports, a light draft twin-screw sand pump hopper steamer for the New South Wales Government, and a special steam vessel fitted with a powerful derrick crane, to be used in the formation of the Plymouth Breakwater, for the British Admiralty.

LAUNCHES—IRISH.

New England.—On April 7th the twin-screw steamer *New England*, the latest addition to the Dominion Line, was successfully launched by Messrs. Harland & Wolff, Limited, Belfast. The steamer is of large dimensions, having a tonnage of nearly 11,600. The steamer is designed to carry a large number of first and second-class and also steerage passengers. The saloon is situated in a deck-house erected on the hurricane deck, with seating accommodation for nearly 200, and is surmounted by a very elaborate dome skylight in handsome stained glass, with decorated panels. The ship has two pole masts, and will be capable of crossing the Atlantic at any season of the year without cargo if necessary, having large water ballast tanks fitted fore and aft. The steamer, besides being fitted with all the necessary appliances for the rapid loading and discharging of a large general cargo, can be fitted up if necessary for the conveyance of dead meat, and is also in every way suitable for the transport service. The machinery consists of two sets of quadruple-expansion engines of the latest description. The *New England* will sail from Liverpool on the 30th June.

Rippingham Grange.—On April 18th a further addition to the large fleet of Messrs. Houlder Bros. & Co. took place by the launch of the *Rippingham Grange* from the South yard of Messrs. Workman, Clark & Co., Belfast. This is the sixth steamer built by this firm for Messrs. Houlder Brothers' trade with Australia, South America, East and West Africa, and London, Cardiff, and Newport. She has been built to take the highest class obtainable at Lloyd's under special survey as also to the Board of Trade requirements for carrying first and second-class passengers. The leading dimensions are:—Length, 420 ft; breadth, 54 ft.; depth, 32 ft. 6 in., with a gross tonnage of 5,850.

A very large deadweight cargo amounting to about 9,200 tons will be carried on the load draught. This large amount can be loaded and discharged in a minimum of time by a complete arrangement of derricks suspended from the masts, and crane posts capable of lifting 10 tons each by means of powerful steam winches numbering 11 in all. There is a large derrick to suit heavy lifts. The principal holds and 'tween decks will be insulated in the most approved manner and refrigerating plant capable of dealing with the large space will be fitted up, also dealing with the chambers for storing the perishable provisions required for the passengers during the voyage. The bridge deck, which extends for about 20 ft., is arranged and fitted up for carrying a large number of cattle, and also under the poop and forecastle. On the top of the bridge extends for the greater portion a large deck-house containing the passengers accommodation, the first-class being situated at the fore end with saloon adjoining, all comfortably and tastefully fitted up with the most modern conveniences, such as electric bells, steam heating, electric light, hot and cold baths. A commodious smoke-room is arranged on the promenade deck above. The second-class passengers are also well catered for and have similar conveniences to the other passengers. A complete installation of electric lighting will be fitted out similar to Messrs. Houlder's other vessels, including lamps for working cargo at night. The various auxiliary engines for navigating the vessel have been provided by first-class makers, and include warping capstans, docking telegraphs, &c., making the vessel very efficient in this department. The work of supervision has as usual been carried out by Mr. Copeland K. Etheridge, Messrs. Houlder's marine superintendent. Machinery capable of developing 3,200 I.H.P. will be fitted by the builders, and steam will be supplied from three large steel boilers fitted with Howden's system of forced draught. A donkey boiler is also provided for the deck machinery. The engine department has been under the superintendence of Messrs. Esplen, Son & Swainston. After the launch the *Rippingham* was placed alongside the finishing berth to have the machinery placed on board.

LAUNCH.—GERMAN.

Elbing.—On March 31st the Flensburg Shipbuilding Co. launched from their yard a new steel screw steamer, built for the Deutsch Australische Dampfschiffs Gesellschaft, in Hamburg. The principal dimensions are:—Length 420, ft.; breadth, 49 ft. 8 in.; depth, 32 ft. 3 in. On leaving the ways she was christened *Elbing* by Miss Bauer.

TRIAL TRIPS.

Ethelbryhta.—On March 31st the fine steel screw steamer *Ethelbryhta* left the port for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, for J. H. Harrowing, Esq., of Whitby. She takes Lloyd's highest class, and is of the following dimensions:—Length, over all, 325 ft.; breadth, 47 ft.; and depth, 24 ft. 10 in. The engines have been supplied by the Central Marine Engine Works of Wm. Gray & Co., and are of their well-known triple-expansion type, having cylinders 25 in., 40 in., and 65 in. diameter, with 42-in. stroke, and two large steel boilers working at a pressure of 160 lbs. per square inch. After adjustment of compasses a party of ladies and gentlemen were taken on board by tug, amongst whom were—J. H. Harrowing, Esq., owner; Messrs. D. Beckwith and T. Hodgson, Easingwold; Mr. T. Bumett, Mr. and Mrs. Noble, Mr. T. Brand, and Mr. W. A. Rhodes, Whitby; Miss Carter (Mayoress), and Miss Summers, Middlesbrough; Mr. W. Weatherill, Redcar; Mr. J. Walton, under whose superintendence the vessel and her machinery have been constructed; Mr. W. Taylor, inspecting engineer, Whitby; and Captains Cornforth and Boagey. The builders of the ship were represented by Captain Murrell, and the engine builders by Mr. Jas. Lindsay. The vessel then proceeded to the Tyne, where she takes in a cargo of coal for Bombay, averaging on her way round a speed of 11½ knots. The performance of both vessel and her machinery was highly satisfactory.

Assyrian.—On Thursday, March 31st, the steamship *Assyrian*, built by Furness, Withy & Co., Limited, Hartlepool, to the order of Messrs. F. Leyland & Co., Limited, Liverpool, proceeded on her trial trip in Hartlepool Bay, and had a very successful run. She is a fine type of a modern cargo boat, measuring over 360 ft. in length, and built throughout of Siemens-Martin steel with large measurement and deadweight carrying capacity of about 4,600 tons, built to Lloyd's 100 A1 class to their three deck rule. All deck erections, skylights, bulwarks, etc., are constructed of steel and iron, cellular double bottom fitted fore and aft for water ballast, the after peak being also available. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Six powerful steam winches, one multitubular donkey boiler, patent steam steering gear and screw gear aft, patent direct steam windlass, stockless anchors hauling into hawse pipes, and all modern appliances are fitted for the handy working of the ship. The saloon and cabin providing accommodation for the captain is handsomely finished in polished hardwood. The vessel is rigged as a two-masted fore and aft schooner. Triple-expansion engines are fitted by Messrs. Thomas Richardson & Sons, Limited, Hartlepool, which have every provision for economical working, and during the trial attained a speed of 13 knots, and ran very smoothly. The ship and machinery have been constructed under the superintendence of Mr. Neville Evans on behalf of the owners. The vessel proceeded to Sunderland after the trial to load.

Athos.—On March 31st the steamer *Athos*, which has just been tripled by Messrs. MacColl & Co., Limited, Abercorn Basin, Belfast, went on trial. The *Athos* is 290 ft. long, 35 ft. beam by 23 ft. deep, and her gross tonnage is 1,944, being specially arranged for the passenger and fruit trade between New York and the West Indies. The iron main deck has been almost entirely renewed. A new watertight bulkhead has been built at the fore end of machinery space; the bunkers have been rearranged and entirely renewed, the engine seating extended, and the after watertight bulkhead shifted and rebuilt to admit of the additional engine being fitted. The engines have cylinders 23 in., 38½ in., and 64 in. diameter, by 4 ft. stroke, capable of giving out 2,000 indicated horse-power, which was exceeded in the trial. Steam is supplied by one large boiler, weighing over 80 tons, working at 180 lbs. pressure, and fitted with forced draught arrangements. The machinery worked in a satisfactory manner, and the four runs on the measured mile gave a mean speed of 12½ knots. The *Athos* afterwards proceeded to Kingston, Jamaica.

Greville Vernon.—On March 31st the twin screw tugboat *Greville Vernon*, which Messrs. Rodger & Co., Port-Glasgow, have built, and Messrs. Ross & Duncan, Govan, engined for the Ardrossan Harbour Company, completed her trials in the Firth of Clyde, and was handed over to her owners. The vessel is 105 ft. long, 21 ft. 3 in. beam, and 10 ft. 6 in. deep. Her gross tonnage is 170, and her I.H.P. on trial 520. Over the measured mile at Skelmorlie her average on two runs approached a speed of 11 knots. As the harbour of Ardrossan grows in favour with shipowners, gradually bigger vessels use the docks, and in the expansion it was considered necessary to provide more powerful towing facilities.

Joseph Holland.—On April 2nd the *Joseph Holland* left the yard of Messrs. John Blumer & Co., at Sunderland, for her trial trip. This steamer has been built to the order of Mr. F. S. Holland, of London. The vessel has been built to the highest class at Lloyd's, and is of the following dimensions:—Length, between perpendiculars, 264 ft.; breadth, 39 ft.; depth, moulded, 19 ft. 5 in., and has been built on the deep frame system, having very large hatchways to facilitate trimming. The engines and boilers were built by Messrs. George Clark, Limited, of Southwick. The trial was in every way successful, the engines working smoothly, a speed of 11½ knots being obtained.

Koordistan.—On Saturday, April 2nd, the above named vessel left West Hartlepool for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, for Messrs. Frank C. Strick & Co., Limited, of Swansea and London. Her length is 316 ft.; breadth, extreme, 43 ft.; and depth, moulded, 20 ft. 10 in., and she takes Lloyd's highest class. The type of vessel is that of partial awning deck, with raised quarter-deck and poop, and the rig fore and aft schooner with telescoping masts. Very tasteful cabin accommodation has been provided under the poop, consisting of saloon, state-rooms, captain's and officers' rooms. The engineers' quarters are amidships, and the crew's berths forward. The machinery of the *Koordistan* has been supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited, the engines being of the triple-expansion type, with cylinders 23 in., 36½ in., and 62 in. diameter by 39-in. stroke, supplied with steam by one large steel boiler, working at 160 lbs. per square inch, and fitted with Howden's system of forced draught. The vessel and machinery have been constructed under the superintendence of Mr. Archibald Walker, and this gentleman, together with Captain Murrel, representing the shipbuilders, and Mr. T. Mudd, the engine builders, were present at the trial. After the trial, which proved very satisfactory, the vessel proceeded on her voyage to London for her first cargo.

Valentia.—On April 5th the trial trip of the steam trawler *Valentia*, recently launched by the Irvine Shipbuilding and Engineering Co., Limited, Irvine, took place, and proved satisfactory in every respect. The owners are Messrs. Hagerup, Doughty & Co., Grimsby.

Paddington.—On April 7th the steamship *Paddington*, recently built by Messrs. Ropner & Son, Stockton-on-Tees, to the order of Messrs. Evan Thomas, Radcliffe & Ço., Cardiff, proceeded on her trial trip in the Tees Bay, which was very satisfactory to both owners and builders, the machinery giving the utmost satisfaction and working smoothly. The steamer has been built with the builders' patent "Trunk," has full poop, bridge, topgallant forecastle, &c., and will carry a deadweight cargo of about 5,900 tons. The steamer is fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited, Stockton. This steamer has been built and completed under the inspection of Captain Hesketh, the owners' marine superintendent, who was present at the trial trip.

Johanna.—On Friday, April 8th, the steel screw steamer *Johanna* left Greenock and proceeded down the Clyde upon her trial trip. The vessel is of the following dimensions:—Length, between perpendiculars, 230 ft.; breadth, moulded, 34 ft.: depth, moulded, 16 ft. to main deck; gross tonnage about 1,200; is of the raised quarter-deck and topgallant forecastle type with double bottom, and has been built to the order of Jos. De Poorter, Esq., of Rotterdam. The machinery, which has been supplied by Messrs. Hutson & Sons, Glasgow, consists of triple-expansion engines with cylinders 17 ins., 27½ in., and 44 in., by 33 in. stroke, steam being supplied from a large steel boiler working at 160 lbs. pressure. The vessel is fitted with extra large hatchways, is thoroughly equipped with the usual appliances for rapid loading and discharging of cargo, and in every way suitable for the Rotterdam and Cardiff trade for which she has been built. The hull and the machinery have been constructed under the personal supervision of Mr. Geo. H. Strong, M.I.N.A., consulting engineer, Hull, and upon the trial trip the engines worked most satisfactorily the whole of the time, and at the termination thereof the vessel returned to Greenock to complete her outfit, etc., after which she will proceed upon her maiden voyage under the command of Captain R. Dobbenga.

Louga.—On April 8th the trial trip of the pioneer steamer of a new line which has been constituted for a direct steam service between Leith, Dundee, and Southampton, took place on the Firth of Forth, with the new steel screw steamer *Louga*, 1,250 tons deadweight capacity, which has just been completed by Messrs. Ramage & Ferguson, Limited, Leith, to the order of Mr. Thomas Cowan, of Grangemouth. This new development in the East coast shipping trade supplies a convenience long desired by shippers of cargo to South Africa, as well as South and North American ports, and working arrangements have been entered into and concluded with such important shipping companies trading from Southampton as the Royal Mail Steam Packet Co., London, and South Western Railway Steam Packets, American Line, and Union Line to the Cape. It is intended to have a weekly service from Leith and Dundee in connection with the sailings of the foregoing lines, and arrangements are being made accordingly. The *Louga* is a screw steamer of the following dimensions:—Length, K. and F., 213 ft. by 32 ft. by 14 ft. 6 in. depth, moulded, with topgallant forecastle, raised quarter-deck, and long bridge, with cabin accommodation amidships. The engines are triple-expansion, embodying all the most recent improvements, having cylinders 17 in., 27 in., and 44 in. diameter by 30 in. stroke, steam being supplied from a large boiler working at 170 lbs. pressure. All appliances for rapid discharge of cargo have been provided, along with water ballast, steam steering gear, and steam windlass. After running a distance to test the engines, a double run was taken on the measured mile at Gullane, which showed that a speed of 11 knots had been attained, a result considered eminently satisfactory by both owner and builder, as the machinery at the same time worked in the most perfect manner. On the run back to Leith, luncheon was served in the steamer's saloon, and in the course of the proceedings afterwards success to the *Louga* and the new line was proposed by Mr. Ferguson, who made appropriate reference to the enterprise which had been shown by its promoters. Mr. Cowan, of Grangemouth, in replying, said it had been the urgent desire of many powerful shipping companies in the south that such a communication should be established, and he had little doubt but that the public would recognise that a long felt want had been met, and that cordial support would be given by shippers both in the south and in the north. The *Louga* was afterwards headed up the Firth of Forth, and after landing owner and guests at Leith, sailed for Dundee, where the remainder of her first cargo was taken on board in readiness for her first sailing on April 9th.

Gertie.—On April 9th, of the four steam trawlers ordered by the Fleetwood Steam Fishing Co., Limited, from Earle's Shipbuilding and Engineering Co., the first one left Hull for the purpose of undergoing her trial trip. The vessel, which has been named the *Gertie*, is 105 ft. long by 21 ft. beam, has engines of 60 N.H.P., and is fitted with the latest and most improved appliances for the Otter system of trawl fishing. After the run to Grimsby, where the compasses were adjusted and the owners' party boarded her, the *Gertie* was taken out round the Newsand Light Vessel, and a thorough test made of her machinery and the efficiency of the ship, and all being found satisfactory, she returned to Grimsby to take in ice and stores in readiness for her first fishing voyage. The engines were under the superintendence of Mr. A. Bennett, who, with Mr. Paterson, represented the builders, and Messrs. Bryant & Brown were present on behalf of the Fleetwood directorate.

Sarah Brough.—On April 11th the new screw steamer *Sarah Brough*, built by the Ailsa Shipbuilding Co., Troon, for the Zillah Shipping and Carrying Co., Limited, of Warrington, ran her official trials over the measured mile on the Firth of Clyde, Captain Savage, managing director, and a large party of owners and their friends being on board. The vessel maintained a mean speed of 11·1 knots per hour, and behaved in every way to the satisfaction of the owners. Her dimensions are—Length, over all, 139 ft.; length between perpendiculars, 132 ft.; breadth, moulded, 25 ft.; depth, moulded, 11 ft. 6 in. Her machinery consists of compound engines having cylinders 17 in. and 35 in. diameter by 24 in. stroke, with large boiler, working pressure 130 lbs., fitted by Messrs. Ross & Duncan, Govan.

Emanuel.—On April 13th the s s. *Emanuel* had her trial trip. She is a fine steel screw steamer of the following dimensions:—Length over all, 275 ft.; breadth, 38 ft. 6 in., depth, 19 ft. 8 in.; She has been built to the order of the Rederiaktiebolaget. Helsingborg (Mr. N. C. Corfitzen, manager), and takes Lloyd's highest class. The engines are of the triple-expansion type, and have been supplied by the Central Marine Engine Works of William Gray & Co., the cylinders being 19 in., 30½ in., and 51 in. diameter, with 36 in. piston stroke. Steam is supplied by one large steel boiler. working at a pressure of 160 lbs. per square inch. Everything went well on the trial, there being present Mr. Corfitzen, on behalf of the owners, Captain Murrell from the shipyard, and Mr. Lindsay from the engine works. On the conclusion of the trial the vessel proceeded to Burntisland, where she takes in her first cargo for Stockholm.

Bruxellesville.—On Friday, April 15th, the fine mail and passenger steamer *Bruxellesville*, built by Sir Raylton Dixon & Co., Ltd., Cleveland Dockyards, Middlesborough, to the order of Messrs. Elder, Dempster & Co., of Liverpool, for Messrs. Woermann Linie (Societe Maritime du Congo), proceeded to sea for her official trials, under the command of Captain Taggenbrock. This vessel is intended to run in the Belgian mail line between Antwerp and the Congo, and is similar to the *Albertville* and *Leopoldville* lately built by Sir Raylton Dixon & Co. for the same line. Her dimensions are;—Length, 364 ft.; beam, 44 ft.; depth, moulded, 26 ft. Accommodation is provided in most spacious and handsomely fitted cabins for 100 first-class and 60 second-class passengers, with large dining-room panelled with marble of various colours and inlaid woods in house on deck. The first-class smoking-room, ladies' saloon, second-class smoke-room, and cabin entrances are most elaborately fitted and decorated. The ship is lighted throughout by electric light and provided with refrigerating machinery and large cooling chamber for the conveyance of fresh meat, provisions, &c. Powerful triple-expansion engines have been fitted by Messrs. T. Richardson & Sons, Ltd., Hartlepool, having cylinders 27 in., 43 in., 72 in. by 48 in. stroke, supplied with steam by three large double-ended boilers, working a 180 lb. pressure. The hull and machinery have been constructed under the personal supervision of Mr. Pohl, of the Woermann Line, Hamburg.

Norseman.—On April 16th the handsome auxiliary steam yacht *Norseman*, just completed by Messrs. David & William Henderson & Co., Partick, for Mr. S. R. Platt, of Oldham, has had her trials on the Firth of Clyde. She is a very handsome addition to the auxiliary class, and has been fitted out in a most luxurious manner. The vessel has been fitted by the builders with a set of compound engines, and at the trial the machinery worked with great smoothness and with entire satisfaction to all concerned. A mean speed of 11½ knots was obtained, this being above the speed actually anticipated.

M. J. Craig.—On April 16th the new screw steamer *M. J. Craig*, built by the Ailsa Shipbuilding Co., Troon, for Messrs. Hugh Craig & Co., Belfast, ran her official trials on the Firth of Clyde, the Messrs. Craig, owners, and a party of friends being on board. The vessel was fully loaded, carrying 841 tons deadweight of coal, and in this condition attained a mean speed of 11·3 knots per hour, and behaved in every way to the satisfaction of the owners, and of Mr. Joseph Lewis, of Belfast, who was on board, and under whose superintendence the steamer has been designed and built. Her dimensions are—Length, over all, 200 ft.; length between perpendiculars, 192 ft.; breadth, moulded, 29 ft. 6 in.; depth, moulded, 14 ft. 6 in.; gross tonnage, 733 tons; register tonnage, 192 tons. The machinery consists of compound surface condensing engines, having cylinders 24 in. and 48 in. diameter by 36 in. stroke, fitted by Messrs. Dunsmuir & Jackson, of Govan. Hull and machinery have been built under special survey to the highest class in Lloyd's register, and are of the very best style and finish, with all the newest and best appliances, including steam-winches, steam steering gear, steam windlass and capstan forward, steam capstan aft for warping, donkey boiler, large water ballast tanks in double bottom, with special donkey for rapidly filling and emptying; large hatches for the quick and economical loading and discharging of cargo, and a complete outfit for the trade between British ports and Ireland. After the trial the steamer sailed for Belfast with the owners and friends on board.

Umbre.—On April 18th the s.s. *Umbre*, which Messrs. Wigham Richardson & Co., Neptune Works, Newcastle-on-Tyne, have just built for the Cork Steamship Co., Cork, went for a very successful trial trip. The *Umbre* is the third vessel built by Messrs. Wigham Richardson & Co. for this Company, and after the completion of the trial left to take up her station in the Continental Service of her owners under the command of Captain Stubbs. The steamer is 255 ft. in length by 33½ ft. beam, and has very comfortable accommodation for a limited number of passengers. She has been fitted with triple expansion engines by Messrs. Wigham Richardson & Co., and the arrangements for working the ship herself and her cargo are of the most modern and improved type. The owners were represented by Captain Hore, of Liverpool, their marine superintendent, and by Mr. Flockhart, of Liverpool, their superintendent engineer. During the whole of the trial the engines worked without the slightest hitch.

Clarence.—Lately the steamer *Clarence*, of Swansea, built by the Grangemouth Dockyard Co. to the order of the Clarence Steamship Co., Limited, made her official trial trip in Tees Bay. A mean speed of 10½ knots was attained on a double run on the measured mile, the engines working smoothly throughout. The vessel is built for the coal and ore trade, and is practically a self-trimmer. Her dimensions are 225 ft. by 34 ft. by 15 ft. 6 in., and has a deadweight capacity of 1,550 tons on Lloyd's summer freeboard, with a cellular double bottom throughout of a capacity for 500 tons water ballast, thus enabling the vessel to return from the Bay ports in ballast. She is classed 100A1 at Lloyd's under special survey. The machinery has been supplied by Messrs. Sir Christopher Furness, Westgarth & Co., Middlesborough-on-Tees.

Sultan Van Langkat.—Lately this vesssel, built by Sir James Laing to the order of the Royal Dutch Petroleum Co., has been taken for her trial trip. She has been specially constructed for the carriage of petroleum in bulk and general cargo, and is 285 ft. long, 39 ft. 6 in. beam, and 23 ft. 7 in. moulded depth, having engiues 24 in., 40 in. and 64 in. by 42-in. stroke. Steam is supplied by two powerful single-ended boilers. All the latest auxiliary machinery for this type of vessel has been fitted, including powerful pumps for liquid cargo, steam winches, electric light, etc., and arrangements have been made for burning liquid fuel. The vessel has been built to the highest class at Lloyd's, both for hull and machinery, and the Vereeniging Van Assuredenven, of Amsterdam, and has been superintended in the owners' interests during construction by Messrs. Flannery, Baggallay & Johnson, of London and Liverpool. Before being taken over by the owners the vessel was successfully tried on the measured mile burning both coal and liquid fuel.

Earnock.—The s.s. *Earnock*, recently launched by Messrs. J. M'Arthur & Co., Paisley, went down the river on trial. The engines, supplied and fitted by Messrs. Shanks, Anderson & Co., Pollokshaws, worked smoothly and well, and a speed of nine knots was easily attained. The Earnock has been specially designed and built for the coasting trade, and is in every respect a strongly built, well-finished, and well-equipped steamer, and will prove a valuable addition to the fleet of the Glasgow Steam Coasters' Co., Limited, to whose order she has been built and engined. The trial trip was in every way satisfactory to all concerned.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from March 10th to April 12th, 1898.

5844 J. Schofield. Boilers.
5952 W. J. Hay. Valves.
5996 D. W. Fulton and R. Duncan. Engines.
6069 W. H. and R. Thompson. Pressure gauges.
6073 E. L. Pease and Ashmore, Benson, Pease & Co., Ltd. Protecting submerged metal work.
6102 J. Lovering. Sextants.
6115 F. T. C. Webb. Nut locks.
6256 B. Wild. Furnaces for steam boilers.
6257 W. S. Green. Trawl.
6267 H. Obermeyer. Reciprocating rotary engines.
6310 D. and A. M. Reid. Light river dredgers.
6313 W. A. Martin. Bearing bars for furnaces.
6390 W. N. Dack. Valves.
6407 J. W. W. Drysdale and J. Cameron. Pumps.
6411 W. McQuoid, jun. Lowering ships' boats.
6425 W. H. and R. Thompson. Lubricators.
6426 E. H. Reintjes. Safety valves.
6440 W. A. Clark. Heating feed-water for boilers.
6445 W. E. Hutchinson and A. E. Newton. Derricks.
6447 L. M. Meyrick-Jones. Engines and valves.
6467 A. Campbell (J. T. Morrison, South Africa). Water-tube boilers.
6501 J. Rowan. Netting racks for ships' cabins.
6521 W. White. Screws for propelling steamships.
6535 W. E. Kenway and E. V. Hughes. Boats.
6560 R. J. Threlfall. Automatic feed lubricators.
6589 J. Davison. Unlocking water-tight doors.
6596 E. J. Carter. Sextants.
6597 A. Brown. Vessels having elevating decks.
6634 L. Smit and Zoon. Centrifugal pumps.
6653 G. F. Malmros. Piston rods for steam engines.
6678 W. Marchant. Slide valve for steam.
6679 W. Marchant. Slide valve for steam.
6685 W. S. Green. Trawl.
6688 A. Pengelly. Oars for rowing boats.
6693 J. Lyall. Machinery for steering.
6711 J. T. McMurtry. Nut locks.
6753 A. Orling and C. G. G. Braunerbjelm. Steering torpedoes.
6802 T. Jenner. Diminishing risks of cables parting.
6817 F. H. Heath. Thrust roller shaft bearings.
6820 L. M. M. Bowers. Anchors.
6833 F. Newkirch. Steering gear of ships.
6856 L. Smith. Lifeboats.
6914 J. A. and S. Fletcher. Water gauges.
6915 F. W. Zimer. Means of transporting boats.
6945 H. Porter. Steam boilers or generators.

46	R. Kommerell. Steam boilers.
6951	T. F. and T. S. Walker. Ship log apparatus.
6961	J. J. Tomkin and J. Eaton. Steam boilers.
6979	W. J. Brewer. Floating breakwaters.
7001	J. Grouvelle and H. Arquembourg. Low-pressure boilers.
7005	Galloways, Ltd., H. Foster and A. Etchells. Compound steam engines.
075	J. A. Kollmyer and G. D. Rand. Engine valves.
7081	C. B. Phillips. Armour plates.
7134	G. F. Fitzgerald and F. T. Trouton. Steering vessels.
7140	W. Osbaldeston. Utilising the force of waves.
7173	G. W. Morris. Boat-lowering apparatus.
7237	E. W. T. Richmond. Boilers.
7257	P. F. Maccallum. Internal combustion engines.
7259	S. P. F. Lehmkuhl. New paddle-wheel.
7307	J. Tabrar and W. Waller. Water gauges for steam boilers.
7314	A. Dalrymple. Steam generator furnaces.
7315	W. Chadburn and R. R. Bevis, jun. Ships' telegraphic apparatus.
7316	R. R. Bevis, jun., and J. H. Gibson. Equilibrium valves.
7320	G. H. Sheffield and J. D. Twinberrow. Self-lubricating Steam engine.
7368	H. F. M. Lemaire. Pumps.
7369	P. Martinelli. Valves.
7382	E. Wilson and C. J. Evans. Steering submarine boats.
7405	L. Marshall and S. Naylor. Steam boilers.
7410	J. Harrison. Balancing of steam engines.
7414	E. J. Curtin. Screw propellers.
7419	J. Nichols. Valve gears for steam engines.
7436	E. Spicer and C. W. Colthrup. Covering for steam pipes.
7458	E. Jones. Chucks for machine tools.
7483	Tangyes, Ltd., and J. N. Floyd. Packing rings.
7485	J. Hussey. Float valve.
7533	A. J. Boult (H. Stanton, United States). Steam boiler.
7546	V. I. Feeny (The Pacific Dredging and Reclamation Co. United States). Dredging apparatus.
7555	J. H. Bunnell and C. J. Kintner. Utilising the force of waves.
7568	A. E. L. L. Leveque. Ships.
7593	A. T. Booth. Steam engines.
7594	A. T. Booth. Valve gear.
7628	J. Smith and G. Scruton. Block tackle.
7652	J. J. Connell. Rowlocks.
7661	J. S. Trench. Boats.
7674	J. B. Hirschmann. Propellers.
7682	L. Ficker and A. Wagner. Metallic packing.
7697	A. Krauss. Sights for prismatic compasses.
7699	J. Green and G. Riches. Metallic packing.
7710	F. Molyneux. Minimising rolling of vessels.
7718	W. Chadburn. Ships' telegraphic apparatus.
7719	A. E. Line and J. Abraham. Shackles.
7737	A. G. Hay. Valves.
7787	J. Tannahill and A. Eadie. Rolling welded tubes.
7788	W. B. Culver. Valve gear for steam engines.
7800	C. A. Eicke. Dry dock for screw propellers.
7813	R. Sykes. Anchors.
7845	W. J. Reynolds. Overhead ships' compasses.
7850	H. L. J. C. Turc. Navigable vessels.
7861	W. L. Casaday. Boiler flue cleaners.
7884	W. McAlpine. Rotary engines.
7885	W. Oliphant (A. A. Griffing Iron Co., United States). Steam traps.
7898	E. C. Holden. Steam generators.
7934	P. A. Newton (C. Schneemann, Germany). Boat-lowering mechanism.
7958	J. H. Barry. Electric propulsion of ships.
7962	J. I. Booker. Corrugated flues for furnaces.
7973	E. T. Ferrier. Floating metallic packing.
7977	T. M. Grant. Fishing hooks.
8035	H. H. Leigh (W. H. Rothwell, B.I.S.N. Co.). Boat-clearing gear.
8050	J. C. R. Okes. Water-tube boilers.
8071	G. Bowmar. Coast and harbour defences.
8074	H. H. Fletcher and B. Brown. Apparatus for throwing ropes to ships in distress.
8084	D. L. Martyn. Flues for boilers.
8201	R. Stokes. Ship thimbles.
8215	H. J. Wood. Asbestos bottoms for vessels.
8266	Vickers, Sons & Maxim, Ltd., and A. Adamson. Steam generators.
8302	J. Mazieres. Water-tube boilers.
8326	A. Rahner and P. D. Minick. Boiler furnaces.
8387	W. H. Cocks and A. J. Newton. Funnel.
8400	F. S. Cormier. Rudder frame.
8410	W. Ivanoff. Boilers.
8420	T. W. Ball. Anchors.

BOARD OF TRADE EXAMINATIONS.

Extra First Class.

April 23rd, 1898.—	Clay, James R...	Ex. 1C	Liverpool
" "	Dunbar, Peter ..	Ex. 1C	Glasgow
" "	McArthur, J. D.	Ex. 1C	London
" "	M'Kinlay, Jno.	Ex. 1C	Liverpool
" "	Richardson, W.	Ex. 1C	Hull
" "	Spencer, Thos...	Ex. 1C	Liverpool

NOTE.—1C denotes First Class; 2C Second Class.

March 26th, 1898.

Bayne, James..	2C	Aberdeen
Biggins, Jno. ..	1C	N.Shields
Broad, Wm. H.	2C	"
Bush, Chas. P..	1C	London
Damble, John..	2C	N.Shields
Dobson, Thos. R.	2C	"
Dunn, Wm.....	1C	Bristol
Garden, Wm...	1C	Aberdeen
Gibson, Hugh..	1C	"
Jackson, A. S.	2C	Liverpool
Kelly, Jno. M...	2C	S'nd'land
MacGregor, A.C.	2C	London
Massared, C. B.	1C	"
May, Wm. R ..	1C	"
McLean, T. A.	1C	"
Melville, David	1C	N.Shields
Milburn, G. R.	2C	"
Pollock, Thos...	2C	Aberdeen
Robinson, G. T.	2C	London
Svendsen, Olof	1C	Bristol
Thompson, J.M.	2C	N.Shields
Wells, G. P....	1C	Liverpool
Willis, Alex. ..	2C	S'nd'land

April 2nd, 1898.

Addison, G. W.	2C	N. Shields
Brown, David..	1C	Glasgow
Brown, John ..	2C	N.Shields
Davies, David ..	2C	Cardiff
Davies, H. L...	1C	London
Drysdale, Peter	2C	Glasgow
Duffey, J. W. ..	2C	N.Shields
Forbes, J. J. A.	2C	"
Gillies, F. J. ..	2C	Cardiff
Graham, Daniel	1C	Glasgow
Jenkins, Thos.	1C	Cardiff
Jensen, V. A. ..	1C	Glasgow
Johnston, W. A.	1C	"
Keay, Alex. A.	1C	Liverpool
Krammer, F. ..	1C	Cardiff
McPhee, Thos.	1C	London
Meldrum, J. ..	1C	Glasgow
Montgomery, D.	1C	London
Nall, Vipond ..	2C	N.Shields
Rowlands, D. ..	2C	Cardiff
Sheriff, J. M. ..	1C	Glasgow
Smith, John ..	2C	"
Taylor, J.	2C	London
Thompson, A. E.	1C	N.Shields
Tindale, Wm...	1C	"
Venables, H. W.	1C	Liverpool
Warden, James	1C	Glasgow
Watkins, T. C.	2C	Cardiff
West, Fredk. ..	1C	"
Wilson, Alex. ..	2C	Glasgow
Wood, J. M. ..	2C	Liverpool

April 9th, 1898.

Atkinson, G. A.	1C	London
Bleasdale, H. ..	2C	Liverpool
Brown, J. J. N.	1C	N.Shields
Burdes, T. W.	2C	"
Byers, Wm. ..	1C	"
Crawford, J. L.	1C	London
Defty, H. J. ..	1C	N.Shields
Halliday, J. E.	1C	"
Hurst, C. E. ..	2C	Liverpool
M'Henry, C. E.	2C	London
Price, Robert ..	1C	Liverpool
Rodger, M.	1C	"
Rutter, G. W...	2C	"
Wells, Frank ..	1C	"
Wilson, A. W.	1C	N.Shields

April 16th, 1898.

Alexander, D.H.	2C	Leith
Armstrong, S...	1C	London
Ballantine, J...	1C	Greenock
Barnsley, E. ..	2C	N.Shields
Brebner, B.R.M.	2C	London
Butlin, W.H.deF.	2C	Hull
Cooper, Wm. ..	1C	Leith
Corkhill, Jas. C.	2C	Liverpool
Deacon, Henry.	1C	"
Fleming, A. M.	2C	Leith
Fraser, Jas. ..	2C	London
Garrood, Chas.	2C	N.Shields
Guyan, W.H.W.	1C	Greenock
Hobson, Arthur	1C	Hull
Jolliffe, G. H...	2C	"
Law, James ..	1C	Liverpool
Mason, A. H. ..	1C	London
M'Callum, G. ..	2C	Greenock
M'Leod, J.W.R.	2C	London
Mindo, A. W. ..	1C	Liverpool
Morrison, N. ..	1C	Greenock
Moss, J. A. ..	2C	Liverpool
Murray, D. ..	1C	Leith
Newton, R. ..	1C	"
Paulsen, Z. ..	2C	"
Paynter, R.H...	1C	London
Pert, James ..	2C	Greenock
Reynolds, W.H.	2C	Dublin
Roach, Robt. B.	1C	Hull
Smith, Alex. ..	1C	Greenock
Stephenson, W.	2C	N.Shields
Stewart, J.H...	1C	London
Stove, Alex. L.	2C	N.Shields
Taylor, A. ..	1C	London
Taylor, J. R. P.	1C	Liverpool
Taylor, Wm. ..	1C	"
Wake, T. B. ..	2C	N.Shields
Wheatley, T. E.	1C	Dublin

The Marine Engineer.

LONDON, JUNE 1, 1898.

WE have the annual report of the Institute of Marine Engineers for the year 1897 to 1898 before us, and must again congratulate the Profession upon the flourishing condition of its representative Institute. If its success and the honour and esteem in which it is held by marine engineers and those of cognate professions is to be gauged by its financial support, and we know no better test, the handsome surplus of annual revenue carried over from cash absolutely received, after the generous expenses of the year, including educational classes, have been met, will leave the position of the institute in no doubt. Unfortunately the obituary notice for the year includes the names of several prominent members, of which threewere vice-presidents and one a companion who had rendered great help and valuable support in its initiation and early career. We are glad to note that the new memberships for the year, though not so great as last year, much exceed the losses to the Institute by resignation or death, though a large number of names have been removed from the roll owing, probably, to carelessness in the case of many members having failed to notify changes of address, and communications to whom have been returned as "not known." We trust if this journal should reach any of those who have thus been lost to sight, they will do what they can to be reinstated. Classes for mathematics, electricity and drawing have been carried on during the session, and no doubt the disappointment as to attendances mentioned in the report has been greatly due to labour troubles which have imposed irregular and late hours upon many of the apprentices and younger members. The presence of the Premier of New Zealand, the Hon. R. J. Seddon, at the annual dinner, and his graceful compliment to the President of a neat new gold badge, signifying associateship with the Colonial Institute of Marine Engineers, has pleasantly signalized the past session, and has further cemented the friendship between the Marine Engineers of Great Britain and her Colonies.

THE rapidly increasing high steam pressure now being so universally used in marine boilers will undoubtedly accentuate the troubles arising from impure feed water. The deposition of salts and organic matter is considerably increased as the pressure rises and the formation of the consequent scale becomes harder, whilst at the same time the pressure upon the tubes and shell is greater and more ready to destroy the structure if overheated. In land boilers the furring up of the surfaces with salts of lime is the usual trouble, forming, as they do, a compact non-conducting surface over the evaporating surfaces where they are most deleterious. Not half enough care is taken in such cases to use a selected feed water or to precipitate by prior boiling or treatment with lime or soda the carbonate of lime held in suspension. The resulting cost in cleaning and maintenance of the boiler in fair working condition cost the user much more than he would expend in properly purifying or softening the feed water before allowing it to enter the boiler. In the case of boilers at sea, the feed-water used being invariably the result of evaporation and condensation, the dangers to the boiler from foul feed-water are quite otherwise than on land. The condensed water naturally contains no lime salts, but, unfortunately, tend to become saturated with grease and fatty acids from the cylinders. This, if sufficiently foul, may cause heavy organic deposits on the heating surfaces, but are more dangerous still in setting up from their acid character, pitting, and corrosion in plates and tubes, very probably due also to electrolytic action between dissimilar metals in the boiler, the acidified water representing the stimulating electrolyte. In this case the best preservative would be a slight deposit of salt or carbonate of lime over the whole interior of the boiler. This might be secured by making the first charge in the boiler, on starting a voyage, salt water for the sake of its saline deposit, or hard land water for the sake of its resulting slight deposit of lime salts. After such first charge, evaporated or condensed water might be used, and, the first coating of salts being very slight, would prove an excellent preservative for the interior surfaces of the boiler, bidding defiance to the corrosion and pitting now so troublesome. The filtration of feed-water to remove the fatty organic matter as much as possible before it is admitted to the boiler, now so much used at sea, is also an excellent precaution, and sure to pay for the outlay on the extra plant, and for the attention to the same and the filtering material used in the preservation of the evaporative surfaces from grease coating.

WE must look to our laurels in all departments of shipbuilding and engineering as regards the keen competition of the Germans in these branches of the profession. Not only are they beating the record in the size, tonnage and speed of their finest liners, but in the mechanical details of their works and shipyards they are developing ingenuity and originality. The shipbuilding works of Messrs. Blohme & Voss, in Hamburg, have shown great enterprise hy the successful adoption of a new form of crane for hoisting in boilers and other heavy weights in the equipment of steamers. This crane has the combined advantages of a radial traversing crane and of a shear legs, insomuch that, whilst capable of traversing it can also be adjusted as to overhauling from 60 to 160 ft. measured from the central axis of rotation. This gives the crane great adaptability to various sizes of vessels moored alongside the wharf on which it is erected. The above peculiar adaptation is effected by the upper part of the jib being pivoted upon the lower standards, so that by a system of screws the upper part of the jib may be raised or lowered on the lower portion, giving it the wide range of adjustable overhang mentioned above. The crane was completed and set to work about the end of last year, and has worked successfully ever since and given great satisfaction in its adaptability to various jobs.

MUCH interest is being taken in the impending naval conflict between the Spanish and American navies in West Indian waters. Some comparison between the characteristics of the opposed fleets may be interesting. The Spanish first-class cruisers may be better denominated, as regards armour protection and guns, as second-class battleships. Most Spanish armoured cruisers carry 11-in. guns, very good pieces properly served, and able to penetrate all the armour on the American battleships. Some of them are armoured with a partial belt of 12 in. plating, tapering off to the stem and stern, and the smaller cruisers have a 6 in. belt and 10 in. guns, all mounted on barbettes, with, of course, smaller quick-firing guns. Nearly all of these Spanish cruisers have submerged torpedo tubes, which would prove most dangerous weapons of offence at close quarters if well served and in good order, though it is said that the type of these submerged torpedo tubes is very untrustworthy and liable to get out of order. The American cruisers are quite different. They are really lightly armoured cruisers. Their belts, instead of being 12 in. of steel, or even 6 in., are only of 3 in. steel and easily penetrated by the big guns of the Spanish cruisers. The biggest guns of the American cruisers are also only 8 in., and though these are exceptionally handy and will give very quick fire, more so than the heavier pieces of the Spaniards, it is doubtful if these lighter guns would at all penetrate the heavy cannon of the Spanish cruisers. However, the main fighting done by the Americans will be by their first-class battleships, which are quite competent by their armour and armament, to meet on favourable terms the armoured Spanish cruisers. As, however, the American first-class battleships are less in number than the heavily-armoured Spanish cruisers, the fight, when it comes off, will be fairly equal as regards relative material, and the result will depend on the pluck and skilful handling of guns and ships, in which there is little doubt the Americans will show their blood and grit.

THE output of the month of April by the shipbuilders of the Clyde, the Forth, the Tay, and Dee, has been a record one, as they launched a total of 33 vessels of 46,200 tons, which is a very handsome comparison with April last year, in which the output was only 28 vessels of 26,902 tons. The present 33 vessels were composed of 26 steamers and 7 sailing vessels, and the Clyde, as usual, represents a large proportion of the above. The industry is said to be extraordinarily active, and it is hoped that 1898 will beat all former records of the tonnage of vessels launched. An enormous number of orders have been booked in the first three months of the year, no doubt representing accumulations held back during the engineering strike, but in April the booking has fallen back to much less than normal. The Tyne, the Wear, and Tees have also been abnormally active, the Tyne shipbuilders having launched 44 vessels in the last four months, and the Wear 25 vessels, which is much above any previous records for the similar period. The Spanish-American war will also tend to make things brisk in the shipbuilding way, as two vessels, each of 10,000 tons deadweight, have been ordered on the Tyne to replace the two vessels sold to the Hamburg-American Company. It is hoped that the men will not rashly spoil the flowing tide of business by urging demands followed by strikes for impossible terms, as they so often have done.

AN important paper was read on April 25th at the Institution of Marine Engineers on Water-tube Boilers, by Messrs. G. Halliday and E. Seabury. The paper possessed two features. For example, the authors adopted the plan laid down for himself by one of the authors in his book on "Steam Boilers" to set down at the outset all the more important experiments which had been made in connection therewith. The effect was obvious. However much practical engineers may argue against the adoption of water-tube boilers in the Mercantile Marine they never on any occasion raise a single objection to any proved experiment. The experiments which the authors thought of most importance were those of Messrs. Blechyndin and Sir John Durston, with the still more momentous ones of Professor Ser. Mr. Kirk's were an old set of experiments, originally made to find in how far he could go with thickness of plate to resist high pressure. Those experiments of Mr. Kirk were not scientific. Neither were those of Sir John Durston on the effects of grease on the surface. They were simply the rough-and-ready experiments made by engineers. Mr. Blechyndin's were of a different order altogether. He set about his task in quite a different way. The results of Mr. Blechyndin's experiments can be relied on as those of a trained scientific experimentalist. Mr. Blechyndin set himself the task of finding by what law the heat of the flame was transmitted to the water in the boiler. Previous to his experiments there was much obscurity on the point. Most people who thought about the matter at all followed Fourier, who proved that the heat went through the plate at a rate in direct proportion to the difference of temperature. Even an authority like Professor Perry owned that he did not know and investigated a rule for the quantity of heat transmitted, on the assumption that it was as the square of the difference of temperatures as well as simply as the difference. Mr. Blechyndin set the matter at rest. His experiments clearly proved that heat was transmitted at a rate in proportion to the square of the difference of temperature. Professor Ser's experiments, which prove that the more rapid the motion of water over a hot surface the quicker the evaporation, have also settled a much vexed question. Experiments on this we have often had before, and the conclusion come to depended on what the maker of a boiler wanted the experiments to prove. But English engineers have now clearly placed before them unmistakable evidence that rapid circulation promotes evaporation. To the records of experiments no objections were raised. It is when one comes to the practical working of the boilers that difficulties arise. One by one engineers rose in their places and shook their heads. Mr. Sage wondered what would happen if tubes went wrong, and when they reached a foreign port they found no tubes to replace them. Mr. Lawrie wondered how many stokers would be found necessary above the ordinary number allowed. To hear some talk it would have been believed that no water-tube boiler ever really carried a ship between two ports. They never had heard that the Messageries Company had been making voyages between France and China for years. They never had heard that Mr. Thornycroft had, with his first boiler, nine years ago, done with success the voyage from this country to Bombay. Nevertheless, under the grumbling, one can detect that there is a screw loose somewhere. Many practical difficulties have to be overcome before marine engineers can, with confidence, prefer the water-tube boiler to its competitor. These difficulties never appear in the reports. But the trials themselves leave no room for question that the water-tube boiler, as an evaporator, has far out-distanced its competitor of the cylindrical type. Take, for example, the trials of Mr. Mumford's boilers of the *Salamander*, made last week at Devonport, when the evaporation from and at 212 degrees was 11·47 lbs., when burning 25 lbs. of coal per square foot of grate, and 8·16 lbs. when burning 70 lbs. of coal per square foot. Then, as to weight. It is a rule in shipbuilding that if any part of the machinery is made lighter by a ton it is a saving in displacement of 4½ tons. Suppose a ton of measurement is worth £10 to the shipowner, and that by using water-tube boilers 20 tons are saved, the saving in displacement is 90 tons, and the yearly saving to the shipowner is £900. A service has been done to engineering by this discussion on the question being brought before marine engineers who, in the near future, may use water-tube boilers.

BRINKMAN'S REVERSING GEAR.

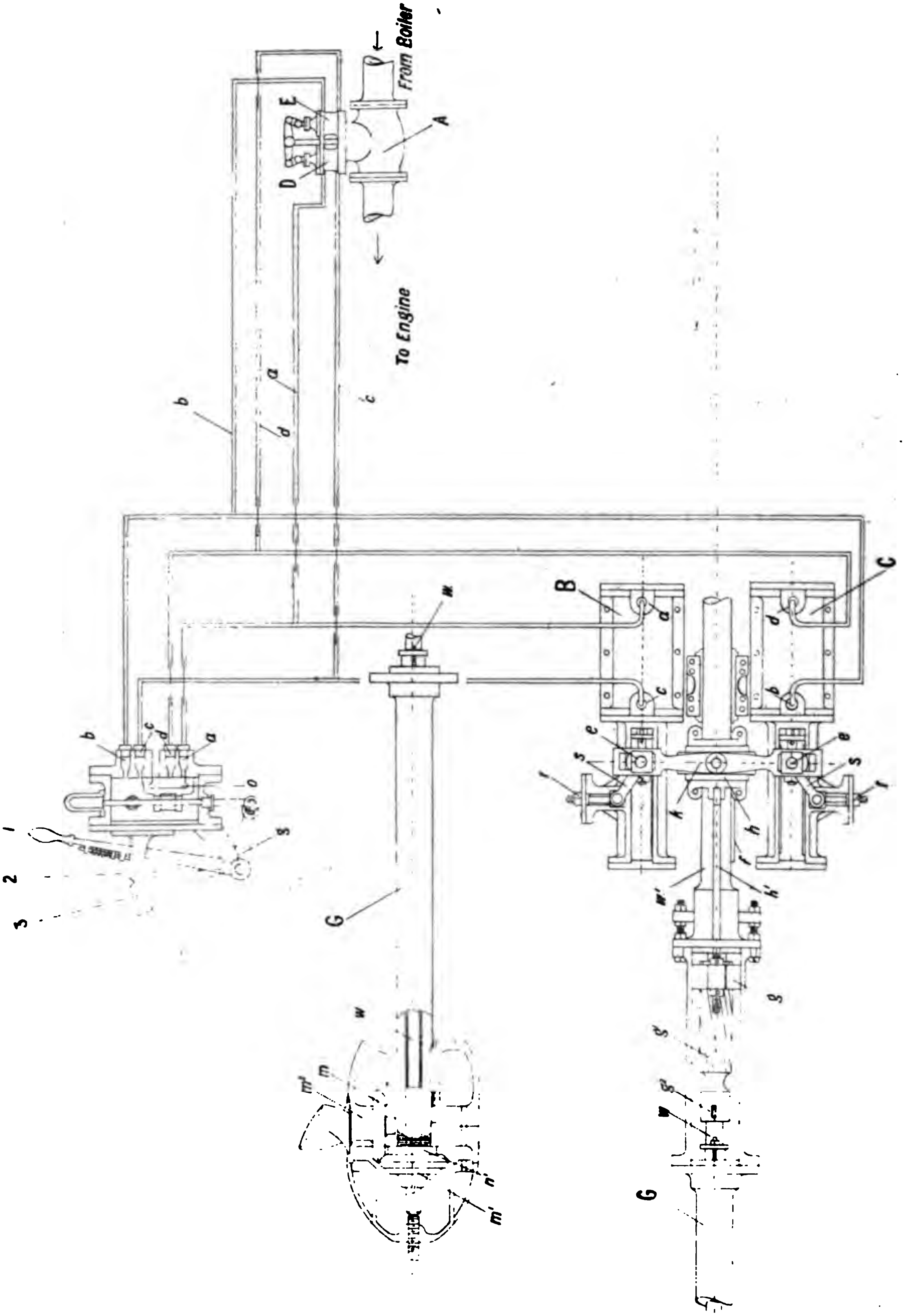
A VERY ingenious and effective form of reversing gear has been invented by Mr. Brinkman, of Munich, which is applicable for a number of mechanical purposes, but which in the presence instance we will describe only in reference to marine engines.

The device consists essentially of a pair of pressure cylinders arranged side by side parallel to one another. Each cylinder has a working piston, the rod of which is connected by links, or their equivalent, to one end of a beam, that is to say, each end of the beam is connected to one of the working pistons. The centre of the beam is connected to the particular gear it is desired to control, such as the reversing gear of engines, the feathering of propeller blades, or the operation of valves.

This gear gives three definite positions, viz., two end positions and a mid-position, so that it will give full-gear ahead and astern, and a mid-gear when used with an engine-reversing gear, or three positions when used with any other gear, such as a feathering gear.

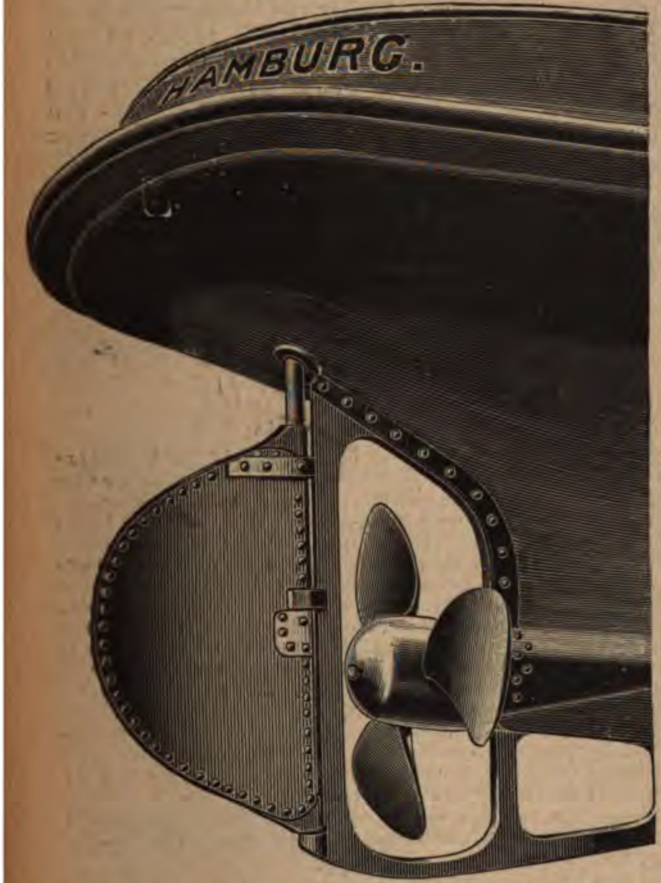
The main object in this invention is to enable a device to be readily controlled from a station distant therefrom, such as the engines from the bridge, and although this object has been attained before by other gears, such gears have only been applicable for small powers, while the Brinkman gear is applicable for any sized engine, no matter how large.

We have pleasure in illustrating this device as applied to the feathering arrangements of a screw propeller, such arrangements being also the invention of Mr. Brinkman. One of the illustrations shows an external view of this particular propeller with the blades turned to no pitch, or mid-position.


From Boiler
To Engine
A
D
E
a
b
c
d
B
C
e
f
s
h
k
h'
w'
g
g'
G
w
m
m'
n
o
1
2
3

BRINKMAN'S REVERSING GEAR.

As will be seen from the diagram, the pressure cylinders are B and C, the ends of which are connected by pipes *a*, *b*, *c*, *d*, to a five-ported slide valve, which is situated on the bridge of the steamers, so as to be operated through the lever *q* by the officer in charge. The crosshead pins *l* of the piston rods carry blocks which slide in the slotted ends of the lever K. In this instance the centre of the lever is pivotted to a collar which engages in a sleeve placed about the shaft w^1, and connected to the nut contained in the hollow portion of the shaft, by means of the draw-bars h^1. A feather *f* is fitted to the shaft, with which the sleeve *h* engages so as to cause it to turn therewith. The nut *g* engages with a screwed portion g^1 which is keyed by a cotter g^2 to the feathering shaft *w* which passes down the centre of the stern shaft G into the propeller boss, where it carries a bevel wheel m^1 which gears into another bevel wheel *m* attached to the shank m^2 of the propeller blade.



It will be noticed on the right of the diagram that the engine stop-valve A is fitted with a similar pair of pressure cylinders D and E and a crosshead, and, further, that branch pipes from pipes *a*, *b*, *c*, *d*, are connected to the ends of the cylinders. It is intended to use compressed air as the operating medium for large engines, but steam may be equally applicable in small jobs.

When the hand lever is at the position *1* it will be seen that the pressure from the valve box is communicated through pipes *b* and *c* to the bottom end of cylinder D and upper end of cylinder E, whereby the crosshead is put into an angular position and the valve is opened; the pressure also communicates with the left-hand ends of the cylinders B and C, thus keeping the letter *k* at the extreme right end of the stroke. Immediately the hand lever is placed on position 2 the valve *o* has moved so that the pipe *c* is cut off from, and the pipe *a* is opened to, the pressure, which closes the stop valve A and simultaneously forces the piston of the cylinder B to the left, forcing the lever K into an angular position, so that its middle portion takes a central position in the range of travel. This corresponds with the stop position, or, as in the present instance, the position of non-effect of the propeller blades. On again moving the hand lever, so that it takes position 3, pipes *b* and *c* are cut off from, and *a* and *d* are opened to, the pressure, so that the valve A is again opened and the piston of the cylinder C is moved to the left, moving the lever K into its extreme left-hand position.

From this description it will be seen that the apparatus is very simple, is easily applied, and appears to be capable of working with great efficiency, enabling the officer on the bridge to have absolutely the control of the operations of the propeller. We understand this gear has been fitted to a steamer on the Elbe and has given most satisfactory results.

Further particulars can be obtained from Messrs. Wallace & Co., of 9, Gracechurch Street, London, E.C., or Mr. A. J. Benn, of Thrift Hall, Pasture St., Great Grimsby.

THE INTERNATIONAL HIGH GRADE AUTOMATIC INJECTOR.

IN the adjoining illustrations we show a type of injector which, it is claimed, differs from any automatic injector yet placed on the market, as being based on new principles; it combines the features of a positive with those of an automatic injector. The object of this combination is that much hotter water can be delivered, and higher pressure steam can be used than at present is the case in other automatic injectors.

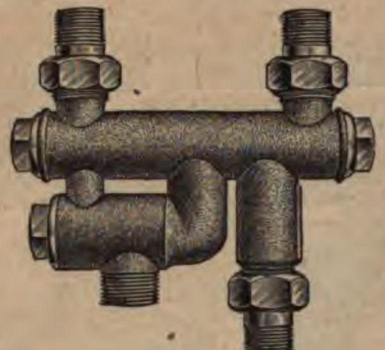


Fig. 1.

It will be seen from the diagram that Fig. 1 is an outside view of the injector, with screwed nipple connections; Fig. 2 is a part sectional view of the same; and Fig. 3 is an enlarged part sectional view of an injector fitted with flanges as means of connection.

The device consists essentially of a casing and only five working parts—the conical jets X G and H, and the overflow valves L and K, and is controlled by the operation of globe valves 7 and 2, fitted in the water supply and steam pipes respectively. In the larger size injectors a seating O and valve P is fitted in the delivery branch.

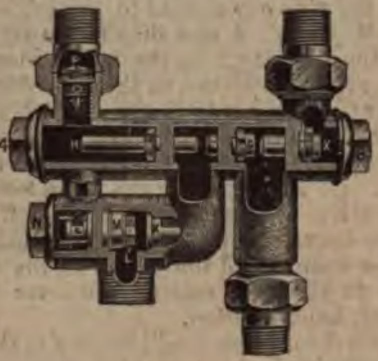


FIG. 2.

In the usual kind of automatic injector heretofore made, the current of water to the boiler has to be established directly against full-boiler pressure, with the consequence that very high steam pressure cannot be carried, nor very hot water handled by the device. As the pressure of steam is continually being raised and as it has been shown to be economical to use a warm feed where it can be done, this new injector appears to fill an increasing want, as we understand it is possible to operate this injector with steam at 240 lbs. pressure, and deal with a water supply as hot as 140 deg. Fah.

The means by which this result is effected are extremely simple, and consist in the following arrangement: Referring to Figs. 2 and 3, the chamber in which the delivery jet H is located, is termed the pressure chamber, and in other injectors there is no outlet from this chamber except into the boiler. It will be seen from the diagrams that in this injector there is an outlet also through valve L, to the overflow, and also a similar outlet from the vacuum chamber, where the jets H and G meet the same overflow.

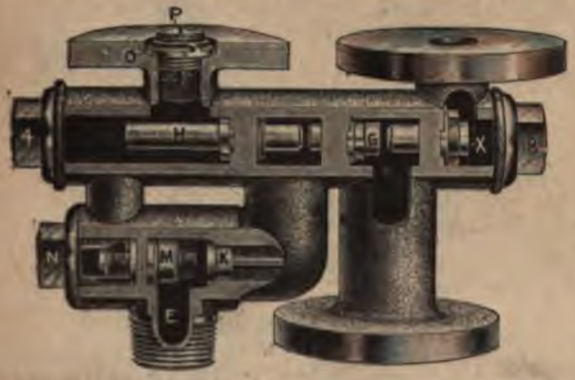


FIG. 3.

It will be noticed that when the valves L and K are seated, the end of the valve L comes against the end of the vacuum valve K. It will be seen that in starting the injector, the water passing down the overflow opens the valve K, which, in turn, pushes the valve L into the open position, so that there is only the atmospheric pressure to overcome, against which it is easy to start the water in motion, it first passing away down the overflow. As soon as the current is properly established, the pressure in the pressure chamber increases and closes the valve L, which in turn closes the valve K, holding it firmly on its seat, thus cutting off the overflow from the jet nozzles altogether, so that the water must go to the boiler.

This action not only allows of the injector being easily started, but enables it to deliver water at a temperature of 140 deg. Fah. at certain pressures, and accomplish as that which in the old style of injectors required two or three valves. It will be seen that by taking out the plugs 4 and 8, a straight-through look can be made, and the fact ascertained as to whether it is stopped or not. All the jets can be taken out by the removal of these plugs without disturbing the injector fittings.

This injector is being put on the market by Messrs. Binney & Son, of Catherine Street, City Road, and 62, Queen Victoria Street, London, E.C. who will be happy to give any further particulars on the matter.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The Battle of Manila

On the 1st May cost the Fleets of the Mail Lines at least one ship. This was the vessel described in the first telegram as the *Mindanao.* This was an abbreviation for *Isla de Mindanao*, and one which led to some confusion, as there is a *Mindanao* in the Spanish Navy. The vessel, which was scuttled in the harbour of Manila, however, was not a warship. She was one of the numerous vessels of the Spanish Transatlantic Company. She seems to have sailed from Liverpool for Manila in her ordinary course, with a general cargo, on the 12th March, to have called at Barcelona on the 25th of the same month, and to have arrived at her destination on the 22nd April. Part of her cargo was still on board when the battle took place. But when the defeat of the Spaniards seemed imminent, she was scuttled to avoid capture. She was a fine vessel of upwards of 4,000 tons gross register, built, under the name of *Lismore*, by the Barrow Shipbuilding Company in 1881. She was constructed for the Johnston Line of Liverpool, and ran in that fleet for over a dozen years. Then she was transferred to her present owners and fitted with new boilers and triple-expansion engines in 1894.

The War

Has enabled the Daily Press generally to lay itself to very great advantage. But the *Daily News* (which prides itself, and justly so, on its war correspondence) has probably achieved a record in this direction, which will hold till at least the end of this century. In its issue of the 11th May, it gave an account of a French vessel, the *Fulton*, which left Havana with refugees on the 7th inst., and closes its remark with the announcement that the "*Fulton* headed N.S.W., and was probably bound to Vera Cruz." The skill of the captain who could head his ship towards three cardinal points of the compass at once is only equalled by that of the correspondent who, under such extraordinary circumstances, was able to judge the probable direction in which the steamer was bound, and to record it so calmly.

Another daily paper did, indeed, speak of the *Lafayette*, of La Compagnie Generale Transatlantique (which vessel was captured and released at Havana by the Americans), as a wooden steamer. But this little inaccuracy pales before the stroke of genius above noticed.

The "Kaiser Wilhelm der Grosse"

Has set the record still higher, so that her new Ebling sister may have a very hard nut to crack, in order to lower it in any particular. In the April instalment of these Notes, I mentioned how the *Lucania* had, in her March trip, broken the eastward record for a day's steaming, getting the distance covered in something like twenty-three hours (which is all the Atlantic liner's eastward day now amounts to), up to 531 nautical miles. On the 15th April the *Kaiser Wilhelm der Grosse* beat this by four miles, and got the figures up to 535 nautical miles. This performance was achieved with what the log calls a "fresh breeze and a smooth sea." It seems, however, that this was the only decent day's weather she experienced on the run. For the log speaks of "north-easterly gale, and high sea one day. Strong breezes, and rough sea on two days, "rough confused sea" on another, and "very rough sea" on the last two. On one day she only made 420 miles, and on others she fell much below her best, and so there was nothing in the passage as a whole to call for further comment.

But on her next outward passage she broke another record. This was for the outward day's steaming. Here, again, the weather was very trying, and the whole time of passage far exceeded her best. But the day before she got to New York she ran no less than 580 nautical miles. It is thirteen miles better than her own previous best, which was in itself a record. This brings her mean speed for the day to something over twenty-three knots.

One would be apt to imagine that she has, in the few trips she has made, since they have been accomplished during the winter months, had very little opportunity as yet to shew her paces, and that she may give us the surprises in speed for 1898. It will be late in the year before the Ebling boat is likely to be allowed to stretch herself and shew what she is capable of. So probably during the present summer, the *Kaiser Wilhelm der Grosse* will have matters all her own way.

Plymouth v. Southampton.

In this connection I may notice that there has been another defection from Plymouth. The North-German Lloyd Company has notified that it, like the Hamburg-American Company, will no longer call at Plymouth, but will make Southampton its British port of call, both outward and homeward. Plymouth thus loses all its connection with the Atlantic Mail Competition.

The Castle Mail Packets.

The report of this company is a very satisfactory document. The directors complain, indeed, of the increasing severity of competition. But that seems to do them no very serious injury. For they manage to increase their insurance fund (which now stands at the handsome figure of £323,426), their reserve (which stands at £135,000 odd), to augment the balance carried forward, to write off a considerable sum for depreciation of their property, and to pay a dividend of 20s. a share. The fleet during the year has seen the mail steamer *Carisbrooke Castle* and the intermediate-steamer *Braemar Castle* launched; though neither of these two vessels—each the largest of her class in the company's fleet—has as yet started on her maiden trip. But even greater things are in contemplation. Two 10,000-ton steamers are building for the mail service by the Fairfield Company, and these are to be twin-screws "of adequate speed." This is good hearing, indeed, alike for shareholders and for the travelling public. Sir Thomas Sutherland's company—the once famous P. and O.—will now have the unenviable monopoly of the single screw for the conveyance of passengers and Her Majesty's mails, amongst what profess to be first-class lines.

Sir Christopher Furness

would appear to have recently been busy as well in the financial and shipping as in the political world. His company, the firm of Furness, Withey & Co., has just issued £300,000 worth of debentures (nominal) at 10 per cent. premium. I believe that even at that price the investment was run after. The prospectus shows us very few details of the many avenues of commerce which the company traverses. But the statement of profits shown might well be good enough for the investors (in debentures merely), to whom was shown the statement of profits earned of recent years. The financial year here closes at the end of April. Thus what I must call 1894 is really chiefly 1893. But with this correction it may pass. The year 1894 showed a profit of about £86,000. The next showed a trifling diminution of under £500 below that figure. Then 1896 saw a spring of £14,000, and 1897 a further jump of upwards of forty thousand pounds. All this, profit clear, without reckoning the provision for debentures, &c. The whole of the ordinary capital is held by the firm and their friends, and thus, during the life of the man who made it at least, the business certainly does offer exceptional advantages.

He also has a quite new adventure—The Manchester Liners, Limited. Here Sir Christopher will be found in the chair. The company has a capital of a million sterling. It starts with two well-known vessels, the *Parkmore* and the *Queensmore*, once of the Johnston Line, but recently in the fleet of Messrs. Elder, Dempster & Co., from whom the new company has purchased them. The line is ordering three more vessels from North-East Coast builders, and its chief object is to trade between Manchester and Canadian ports, i.e., Montreal, when the Saint Lawrence is open, and Saint John, N.B., during the winter months.

Messrs. C. W. Kellock & Co., who, at the end of April disposed of the P. and O. *Ranma* at a highly satisfactory price, failed to secure a customer for the *Alaska* when they offered her at auction. This is hardly surprising, as these valuable ships are not often disposed of from the rostrum. A good indication of their worth is generally found in the room, and the real buyers drop in later.

But the day they offered the *Alaska* they did find a purchaser for the Greenock Steamship Company's s.s. *Gulf of Mexico*," a vessel of two thousand tons gross, and of about fifteen years old, and that at the satisfactory price of £12,000. The present boom in freights was also exemplified by the fact that the damaged steamer *Ethelgonda* was keenly competed for, and that the big four-masted barque *Lord Templemore* also fetched a good price.

A Award for Gallantry.

On the 27th March, in the Atlantic, the crew of the sinking British barque *Bothnia* were rescued by the Compagnie Generale Transatlantique Company's steamer *La Bretagne*, as noted by me in the last Notes. It is now announced that the Board of Trade have made awards to the master of the vessel, Captain Kupe, and to the members of the crew who manned the boat which rescued the distressed seamen, and thus the authorities show our country's appreciation of the gallantry and seamanship of these brave French sailors.

A Considerable Number of Yacht Clubs,

some of which doubtless comprise steam vessels, have received a relaxation of one of the rules framed by the Board of Trade under the Merchants Shipping Act, 1994. It is to the effect that, if other requirements are complied with, the necessity of marking on her stern the yacht's name and her port of registry will be, in those cases, dispensed with.

The Mediterranean-New York Trade

has in the past seen a good deal of competition. Time was when the Italian companies and the Anchor Line had a practical monopoly of the unceasing stream of emigrant traffic which flows from heavily taxed Italy to the New World. Then the North-German Lloyd Company came into it, first of all merely with an occasional yachting cruise in the winter months. Later, the service became a regular one to Genoa. Then the Hamburg Line came in, too, in the same way. During recent seasons there has been a temporary working agreement as to the traffics and sailings in this part of their trade between the two great German Lines. But now it is announced that on the 17th May an agreement was entered into between the Hamburg Line and the General Steam Navigation Company of Italy for mutual working.

The Hamburg Company,

though it has sold two of its fine express steamers to the Spanish Government, is not going to let its share of the best class of Atlantic traffic slip away from it. Its directors have ordered from the Vulcan Company a mail and passenger vessel which shall beat even the North-German Lloyd steamer *Kaiser Wilhelm der Grosse* in speed. This, of course, the builders will know how to do. For they know the exact details of the vessel which they themselves have built, and if they are given *carte blanche*—as they seem to have been in the present case—it is simple enough to go one better than their own performance. The only stipulation seems to have been that the new liner is to steam 23½ knots on the measured mile. What that speed means in actual service will easily be arrived at from a consideration of how the actual sea speed of seasoned Atlantic mail boats compares with their performances on the mile when new. The new vessel will develop some 6,000 H.P. more than the *Kaiser Wilhelm der Grosse*, and will be about 45 ft. longer, though but six inches broader. She will of course have twin screws, for the triple screw is not yet sufficiently out of the experimental stage for wise mercantile builders or owners to risk it. Still when 18,000 I.H.P. has to be transmitted through a single shaft the question of further division of power cannot be far outside the discussion.

The German Mail Lines

have been mutually interested in other important movements. The North-German Lloyd Company and the Hamburg Line have between them absorbed the fourteen vessels of the Hansa Line. They have also come to an agreement as to the working of a joint line to the Far East. For some time the North-German Lloyd Company has had a monthly service thither. Now, by contract with the Imperial authorities, the service is to be made a fortnightly one, and is to be maintained by the two lines on joint account. To carry this agreement out, and to fulfil the more stringent mail contract now entered into—for a very adequate subsidy—with the German Government, four more magnificent twin-screw steamers of 500 ft. in length, and of 15 knots speed, are also building in German yards. All this, is not, of course, business—if we look at it from British economical aspects. For the traffic, as it is now, will never make a return on the outlay, and the German Government has to pay the piper. But the Germans believe that facilities breed traffic, and act up to their belief and hope that their plan will induce a large harvest of commerce in the future which they alone will reap, having killed the British Lines. Be that as it may, the P. and O. Company will find matters very unpleasant when the new boats get to work on the China station.

Bristol to the Rescue of Plymouth,

In this connection it may be noted that the Bristol people are making urgent representations to the authorities against the departure of the Mail Lines from Plymouth to Southampton. They point out that the Western port is a much more convenient centre for the distribution of mails—at least to Bristol—than any other. But assuming that their contention is correct they will never succeed in altering the determination of the shipowners by bringing pressure to bear on Government Departments in this country. For the mail money paid for the Atlantic services is so trifling and inadequate that the country ought to be very thankful to get its letters carried at all for what it pays, and it would be presumptuous in the extreme for the Post Office, under the circumstances, to attempt to force the hands of the mail lines as to ports, without offering much more substantial inducements than it does.

The Report of the Pacific Steam Navigation Company

has some interesting features. In the first place in spite of the misfortunes of the *Oratava*, and of the stranding of the *Corcovado*, the insurance account shows a profit on the year's working. This is satisfactory, and shows how well the company is served by its officers, above and below deck. Further, it appears that the Orient Line will be soon still better equipped than it now is for reaping its share of the Australian trade. For the Pacific Steam Navigation Company for their side of the Orient working are building a new steamer—the *Ortona*—with the firm of Vickers, Sons & Maxim, at the Barrow Yard, where several vessels for that branch of their service have already been constructed. The advent of the *Ortona* and of the as yet unnamed Fairfield ship will make the Orient fleet a strong one, and should enable the managers to dispense with the services of the *Cuzco* and *Lusitania* altogether. If they did that they would get rid of the only two ships they now possess which were built prior to the inception of their service, and one of the earlier vessels (presumably the *Austral*) would become their stand-by.

The Pacific Company is about to extend the services with which it is more personally connected. It is to make calls at Guatemala by arrangement with the local Government, and in time will extend its operations still further northward up the Pacific coast.

The Late Mr. Thomas Mudd, C.E.

Marine Engineers generally will read with surprise and regret the announcement of the death of Mr. Thomas Mudd, Mayor of Hartlepool, at the early age of 46. He died on the 18th May, after a very brief illness. He was in every way connected with the local industry and development of the Hartlepools and for that reason will be greatly missed in the town of his adoption. But his name has a far wider interest in view of the excellent work which he has done for so many shipowners and of the various important changes which he introduced into the design of marine engines.

The First Canadian Mail Service.

It is reported that a preliminary prospectus of the Canadian Royal Mail Steamship Company, Limited, which is to purchase the benefits of the contract entered into by Messrs. Petersen, Tate & Co., with the Canadian Government, is already in circulation. According to the information now obtainable the capital of the company will be something over two millions sterling. It will build—or rather is already building—four fast 10,000-ton steamers to fulfil the conditions of the Mail contract. These vessels are, it is said, of the modified turret deck type. Two of them are placed with Messrs. R. & W. Hawthorn, Leslie & Company, and the other two with an, as yet, undisclosed contractor. The names of the board of the new company have been published and are said to include Lord Tweedmouth (the brother-in-law of the Earl of Aberdeen, Governor-General of Canada) as chairman. Mr. Thomas Boumphrey, at the present time general manager of the Cunard Company, as vice-chairman, and as directors, Mr. William Johnston (of the well-known Johnston Line of Liverpool), Sir Bache Gunard, Mr. Petersen, and others. At all events these names have been publicly spoken of in the connection indicated and the statement has elicited no contradiction.

The Mersey Docks and Harbour Board

has scored a success in the Courts, where it has obtained a ruling which enables it to collect oversea dues from cargo which has, in fact, come from oversea, even where it has been transhipped at a home port, at which it has been treated by the Customs as oversea. That is to say, in the case of non-dutiable goods, the true source of origin may be regarded, and not the mere transhipment to a coastwise vessel. In other words, a declaration of the Courts has been recorded to the effect what the Customs does for its own convenience does not bind the Dock Board so as to make it accept the lower rates in respect of what—but for this action of the Customs—would undoubtedly be liable to the higher rates. The amount at issue in the case in question was quite small, but the establishment of the principle will be a valuable source of income in certain cases to the Dock Board.

OBITUARY.

IT is with sincere regret we announce the death of Mr. Thomas Mudd, on May 17th., which took place at his residence, Moore Terrace, Hartlepool, after an illness of short duration. Mr. Mudd was managing director of the Central Engine Works, West Hartlepool. He was born in 1852, in the village of Kirby Fleetham, North Yorkshire, and was therefore, as far as his business career was concerned, in the prime of life. He commenced his career in 1868 in the well-known works of the Darlington Forge Company, and in 1872 he went as draughtsman to Messrs. F. Richardson & Sons of West Hartlepool. Ten years later, in 1882, Mr. Mudd was appointed by Mr. (now Sir) William Gray, of the firm of Wm. Gray & Co. to design, erect, and manage his proposed new marine engine works at West Hartlepool, with which Mr. Mudd has been continuously identified. In 1887, when the shipyard and engine works of Messrs. Wm. Gray & Co. were turned into a private limited liability company, Mr. Mudd was one of the seven members forming the partnership, and in 1894 he was elected a director.

Mr. Mudd was a mechanical engineer of marked ability, and not only was he able to appreciate the value of an idea, but he could fully realise the commercial side of the matter, and carefully weigh the pros and cons as to ultimate success and failure. There is no doubt that, although in no sense rash, he was one of the most advanced men of his day. As an example of this we may mention the patent five-crank engines which were fitted to the s.s. *Inchmona*, in the summer of 1896, particulars of which we gave at the time. It is claimed that this ship is the most economically engined vessel afloat at the present time, having run for over twelve months on an average of 1·15 lbs. of coal per I.H.P. per hour in sea service.

Mr. Mudd was a member of the Institution of Civil Engineers, of the Institution of Mechanical Engineers—of which he was two years ago elected a Member of Council—of the Institution of Naval Architects, of the Iron and Steel Institute, of the Society of Arts, and of the North-East Coast Institution of Engineers and Shipbuilders. He was also a member of the Council of the Cleveland Institution of Engineers, an honorary member of the Institution of Junior Engineers, and of the London Association of Foremen and Marine Engineers.

In addition to his professional work he devoted a great deal of time to municipal affairs. In 1889 he entered the Town Council of Hartlepool and 1895 was raised to the mayoralty, being twice re-elected; he was in office at the time of his death, and was one of the Diamond Jubilee Mayors, upon whom the Queen conferred the decoration of a medal.

REFLEX WATER GAUGE.

(Klinger's Patent.)

MUCH work and thought has been expended from time to time in the production of water-gauges which shall be capable of being easily observed and of being safe against the risk of fractures, but few of the devices that have been produced up to the present appear to possess such prominent points of merit as the devices that we have now the pleasure of presenting to our readers.

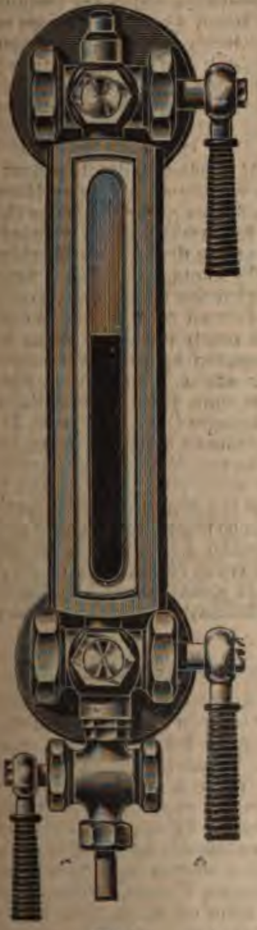


Fig. 1.

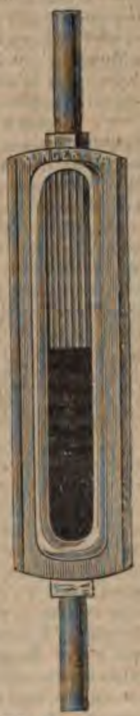


Fig. 2.

The water gauge which we illustrate in the adjoining diagram has its construction based upon the laws of reflection and refraction of light by means of which the water appears black, while the steam shines with a silvery lustre, this effect being produced by the peculiar shape of the observation glass. Referring to the drawings, it will be seen that Fig. 1 represents the patent water-gauge fitted with the usual cocks and fittings of such a mounting, while Fig. 2 shows the glass arranged on a special mounting, enabling it to be fitted to the ordinary cocks and fittings usually put on to boilers.

Mr. Klinger's fitting essentially consists of a metallic casing, capable of standing high pressure, which can be arranged either as shown in Fig. 1 or Fig. 2 as a boiler mounting. Into this casing is inserted an observation glass ½ inch to ⅝ inch in thickness of specially hardened glass, which has been found not to be liable to fracture, even under the most sudden changes of temperature, and will resist a very high pressure.

This observation glass is shaped prismatically, so that it will reflect the light in that part of the gauge which contains the steam, so that sight into the space behind the glass is prevented, and the appearance of the glass presents a bright lustre. In that part of the glass containing the water the light is not reflected but passes with a slight deflection, due to refraction to the back of the gauge. The glass being thus transparent in this part of the gauge, the water will appear of the dark colour of the background of the casing.

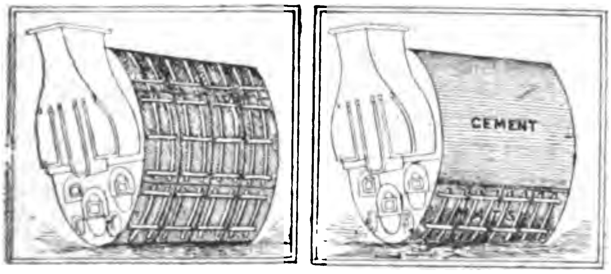
It is claimed that by these means, quick and reliable observation of the water level, effective protection against explosion, and absolute safety against injuries to workmen are obtained.

We would also point out that the disruptive forces which are set up in the ordinary glass tube gauges, due to the difference of contraction and the expansion of the glass tubes and the parts on which they are mounted, are entirely absent in the device.

The Reflex Water Gauge is put on the market by Messrs. Richard Klinger & Co., Engineers, of Fenchurch Station Chambers, 66, Fenchurch Street, London, E.C.

SNOWDON'S PATENT REMOVABLE MATTRESSES.

THE accompanying illustrations shows the appearance presented by marine boilers, either wholly or partially covered with the patent asbestos mattresses recently introduced by Mr. W. F. Snowdon, of No. 2 Side, Newcastle, which, on account of the very palpable advantages possessed by them, are just now receiving a large amount of attention from shipowners. We do not propose here to descant upon the purposes served by the presence of non-conducting coverings on boilers, these purposes being very well known to engineers. A covering which could be applied by the most unpractised hands and which could be displaced, either wholly or in part, without injury, was, however, up till now, a desideratum, and without such, the task of searching for a leak, should one occur, was rendered extremely difficult. Snowdon's mattresses consist of asbestos cloth receptacles filled with asbestos fibre, and bound together by galvanised iron straps, as shown in the illustrations. The outside straps are "lugged" at the ends, so as to permit of the mattresses being drawn closely together by screw-bolts through the "lugs." The mattress itself projects lightly beyond the ends of the straps which bind it, thus making it possible to have the mattresses drawn together perfectly "taut," leaving no slack places, and securing an absolutely close joint. The non-conducting efficiency is consequently, the same at the joints, as at any other part of the covering. Should it be necessary to inspect the boiler shell at any particular place, a single mattress may be removed by simply unscrewing the bolts which connect it with the adjoining mattress, and can be replaced with equal ease by the opposite process. The arrangement must prove of immense value on shipboard, for it is very well known, even to those who are not experts, that though a portion of an ordinary covering might be removed easily enough to get at a suspected place, there would be little chance of the covering being made "whole" again by the inexperienced hands on board, even if they had the requisite materials at hand. On boiler bottoms, where oxidation frequently takes place through excessive radiation from the boiler and sweating from the tank, causing great destruction of tank tops, these mattresses will be found specially useful as a preventative of injury to both boilers and tanks. We understand that the mattresses have been adopted on a considerable number of steamers since their introduction, and that in every case the most satisfactory results are reported. A large number of covering contracts are now in course of execution by the patentee, and, judging by appearances, this ingenious system of boiler covering is likely to be very widely adopted.



NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

Naval Engineers and Surgeons.

THE subject of the pay and position of naval engineers and surgeons has long been one which has caused a good deal of grumbling, which it seems would be considerably lessened if the Admiralty could see their way to better the engineers in this respect, and more especially those below six years' seniority. The responsibilities of our naval engineers are continually on the increase, and it is only right that they should have a little more consideration paid to them by the Admiralty than has been the case until now. At the same time, no one will grudge the surgeons the increase in their pay and position, for that they thoroughly deserve all that they can get in this direction is granted. The young surgeon joining the Service at the present day immediately commences to draw 11s. 6d. a day. In addition, he is pretty sure of a cabin, and messes in the ward-room. The engineer messes in the ward-room, too, but is not at all sure of a cabin, which, if there is one to spare, is more likely to be set apart for the new surgeon than for him. He ranks after the surgeon, although the latter may have only just joined, and although the engineer may possess a seniority of several years. The engineer's pay is increased to a certain extent by charge-money, but this extra does not fall to the share of all engineers. It is to be hoped that the Admiralty will see their way to remedy some of these grievances before long.

Yesterday and To-day.

The speech delivered at the annual dinner of the Iron and Steel Institute by Sir William White, was one which should interest all who believe in the Navy of to-day. The speaker referred to modern battleships as "war machines," that had to go to sea and behave as ships. They had to meet all the forces of winds and waves as much as any ships that ever floated, and they were as fully capable of doing so, but they demanded skill and nerve in dealing with them, which went beyond anything that the officers of the earlier Navy had to face. He said that it should not be forgotten what the changes in material meant to officers responsible for the conduct and fighting of the vessels of the present day. When an officer was in command of a battleship in Nelson's time, he had £100,000 in his charge, whereas in these days, he had £1,000,000; and, although it was quite true that he had command of forces such as his predecessors had no opportunity of employing, yet he thought it might be said without any doubt, that, with this greater command of mechanical forces, there had come a greater amount of responsibility in dealing with the swift-moving vessels of the present day. Sir Edward Carbutt had very kindly referred to himself, and to his endeavours to serve the country in the reconstruction of the Navy. He could assure them that it had been no light task, and it had not been accomplished without bringing him very near to the end of his resources, though he was happy to say that he had somewhat recovered his expended capital. The task would, however, have been impossible, but for the wonderful progress that had been made by the metallurgists and the mechanical engineers of this country. It is not only to the mechanical engineers of the country that the progress which the Navy has made owes so much, but to the officers who are responsible for the efficiency of the propelling power of our present-day warships.

A Hardy Perennial.

Brassey's "Naval Annual" of this year is certainly one of the best which Messrs. Griffin have ever turned out, and it undoubtedly outrivals all similar publications for accurate information, and instructive and authoritative comment. Its success is certain, despite new competitors which are springing up owing to the increased interest taken in naval matters now-a-days. The opening chapter is by the Hon. T. A. Brassey, on the "Progress of the British Navy," and in it the author points out that there is a chance of our losing our naval predominance owing to the large additions being made to foreign navies. In the next chapter, in the book on "Relative Strength," also by Mr. Brassey, he calls attention to the same thing, and puts forward a plea for battleships of moderate displacement. He says that, for operations in the waters of northern Europe or for home defences, vessels of the *Majestic*, *Formidable*, or *Canopus* type are unnecessary, and that for these purposes we need ships with as powerful an armament as our first-class battleships, and with a speed of not less than 17½ knots, and that by accepting some reduction in sea-keeping qualities (coal supply, free board, etc.), these qualities could be secured on a moderate displacement. Mr. Brassey has urged much the same thing before, but his ideas have not been accepted by those responsible for various types of warships now afloat. An article which is exceedingly *apropos* at the same time, is on "Naval Reinforcements of War Time," by Commander C. N. Robinson. It deals with the capacity of English firms to supply armour, and the importing of raw material. Commander Robinson points out that the manufacture of the best armour involves the use of imported ores, and how serious the result would be should the freedom of our maritime transit be interrupted. Other chapters in the book deal with the "Russian Navy," "The Manning of the Navy in time of war," "British food supply in war," &c. Lord Brassey reviews the naval situation, and in the article makes a powerful appeal for a federation composing the whole of the English-speaking race.

The Supply of Armour for our Battleships.

It was recently announced in the papers that Mr. Goschen had paid a visit to the various steel works in the north country, with the supposed object of ascertaining for himself the output of armour of the different firms. His statement in the House of Commons "that the Admiralty did not think that they could rely upon such an output of armour as would justify them in hastening the construction of armoured ships early in the coming financial year," has met with considerable criticism in the press, and the Navy League took the matter up. The executive committee made enquiries of Messrs. Vickers, Brown, Cammell, and Beardmore, and the gist of their replies is, that they could easily carry out much more work than has been entrusted to them, and that the delay which has occurred during the last twelve months was partly owing to the dispute in the engineering trade, and partly to the fact that new plant was being installed. Messrs. Vickers say that they could increase their output of armoured plates to any extent, by spending money, which they would be quite ready to do if they were sure that the enormously expensive plant would not be idle. Messrs. Brown & Co. assert that they are quite capable of dealing with any orders which they are likely to receive from the Government. Messrs. Cammell say that they have recently been engaged in reconstructing their plant, to change the system of manufacture from the Harvey to the Krupp plates, which they have only just completed. They are now making further extensions which, when completed, will in the course of the next few months enable them to produce about 10,000 tons of this improved armour annually, but if sufficient orders for armour were guaranteed to them, there is practically no limit to their capacity for extension. Messrs. Beardmore say that they expect their output of armour could be increased to more than double that of last year. Thus there is apparently no reason why an effort should not be made to make up last year's arrears in building, and it is to be hoped that the visit of the First Lord to Sheffield will have some such result.

The Naval Manœuvres, 1898.

If the "well informed naval circles" which are held responsible for so many curious rumours are to be believed, this year's naval manœuvres will be on a larger scale than any previous year. Indeed, some have gone so far as to say that the fleet is to co-operate with the land forces. Much open-sea work is anticipated, and the basis of the general idea is said to be the struggle between the United States and Spain. Since the days of Nelson, it has been the first principle of naval officers to find the enemy, and there and then destroy him, of course in the open sea, if this can be managed. It seems that the problem they will have to solve in future will be to "find your enemy," if the movements of Admiral Cervera and his phantom fleet can be taken as a precedent. As far as it is known at present, the manœuvres commence on July 9th, and will last for about five weeks. Probably the usual custom of confining the fleets to local battles, and strategetical movements round the British coast, will be departed from somewhat, and if it is, the manœuvres this year will be much more interesting than formerly. It was supposed that the coal strike in Wales would seriously interfere with the operations. As it is, unless the strike is over before the manœuvres commence, the filling of the bunkers of the various ships will nearly exhaust the present stock of Welsh coal, and the Admiralty will have to resort to north country coal. Should the naval and military forces co-operate, as it is anticipated, some exceedingly useful lessons will be learned.

The Naval Employment Agency.

The success which the Naval Employment Agency has met with during the past year is most gratifying to all concerned. The Agency has only been in existence since the summer of 1896, and was started by the "Castaways' Club." During the first nine months, situations were obtained for 138 men, and other applicants were continually rolling up. During the following twelve months, situations were obtained for 360 men, only 94 being disappointed in not finding work. Taken all round, the conduct of the men has been satisfactory, and redounds to the credit of the Service. All sorts of situations have been obtained for the men, such as watchmen, doorkeepers, carriage-attendants, lodge-keepers, stokers, electricians, mechanics, engine-men, warders, store-keepers, boatmen, yardsmen, &c. It is worth mentioning that as a rule, men asking for employment show the greatest reluctance to serve afloat again in yachts, training vessels, or merchant ships.

The list of subscribers to the agency is headed by the Duke of York, and very generous help has been given by naval officers of all grades. The "Castaways' Club" is composed of executive officers, who have received their commissions in the Navy, and is merely a dining club. It was formed for the purpose of bringing together old shipmates, and, in order to show the interest the members of it still felt in the Navy, it was resolved to form a bureau for warrant officers, and men who had finished their time in the Navy, and were desirous of finding employment on land. The outcome of this was the "Naval Employment Agency," whose offices are at 9, Craig's Court, Whitehall.

Aids to Federation.

One of the reasons why the Admiralty have refused to avail themselves of the new naval station offered to us by the Natal colonists, seems to be that the harbour has a shifting bar, and cannot safely admit vessels drawing more than 17 ft. According to information, which has been furnished since the refusal, the Natal Government has been spending large sums of money in dredging, the results of which have been most satisfactory. During the six months ending 31st of March last, it has been shown that the bar depth was maintained at an average of 19 ft. 2 in. at low water of spring tides. Mr. A. Chamberlain, answering Mr. Hogan in the House of Commons, said that the proposals received from the Government of Western Australia for the establishment of a second naval base at Albany, King George's Sound, were referred to the Admiralty. The Government of Western Australia offered to assist the Imperial authorities, by granting lands for naval purposes, and providing a residence for the Admiral; but, in view of the want of depth of water and space for a harbour, and of the fact that no second naval station in these waters was considered necessary, the Admiralty were unable to entertain the proposal. It is a pity that the Admiralty have refused these offers, for there are immense coal-bearing areas in Natal and Zululand, which are only waiting for a fitting outlet for their trade. The strategical value of Albany is also unquestionable. We have many coaling stations, but not too many, and a lesson should be taken from the muddle into which Spain has brought herself through ignoring this question, but, after all, Lord Hopetoun may admit that he has been misinformed, and that the Government will revise the mistaken conclusion into which they have been led.

A New Anchor for the Navy.

In spite of the adverse opinions which were first entertained of the "stockless" anchor, it is, after all, to be given a trial in the Navy. The Admiralty and dockyard officials have apparently overcome the objections they found to it, when they recently went to the North of England to witness a trial, when their opinion as to its suitability for warships was not at all favourable. The new anchor, however, is now to have a fair trial, for the Admiralty have ordered that the new cruiser *Psyche*, building at Devonport, is to be fitted with one, and when she leaves the dockyard, she will commence a series of trials with the anchor. It is not likely yet awhile to supersede the ordinary type of close-stowing anchors, for it can only be properly worked by a special type of capstan, which would have to be fitted to every vessel using the new anchor.

Trials of the "Diadem" and "Terrible."

From a paper read by Sir John Durston at the Institute of Naval Architects upon the trials of the *Diadem*, it appears that he considers the vessel a success. Both engines and boilers have given excellent results. An improvement has been made in the engines by increasing the ratio of cylinder expansion from 5·7 to 1, as in the *Powerful* to 7 to 1, as in the *Diadem*. The boilers of the latter vessel have also been altered considerably, so that the combustion is more effectually completed. The escaping funnel gases are of a much lower temperature. Firing does not require so much attention, and a considerable economy in fuel is obtained.

Altogether, it seems that the *Diadem* is a vast improvement upon both the *Terrible* and the *Powerful*. The modifications in the original design of the Belleville boilers, have contributed to this in some degree. It was realised that this would have been an improvement, if it had been carried out with the *Powerful*. The *Terrible* has not come through her first series of trials with complete success, but then it should be borne in mind, that both this vessel and the *Powerful*, are experiments, and that although thousands of pounds have been spent on these vessels, the money has not been wasted. The *Diadem* class is practically the outcome of the experiments made with the *Powerful* and *Terrible*, as indirectly is the *Cressy* class of armoured ctuisers. It can be taken for granted that the disappointments which the designers of the *Terrible* are to experience are not yet over, but many important lessons have been learned by the failures of the two monster cruisers, and if these lessons are taken to heart, the money spent will not have been thrown away.

Protection of Commerce in War Time.

Commander George A. Ballard, R.N., is to be congratulated on winning the gold medal of the Royal United Service Institution by his essay on "Protection of Commerce in War." Throughout his paper he takes an optimistic view of the various points dealt with. What is perhaps the best portion of the essay deals with the conditions likely to obtain in the event of war between England and the Dual Alliance. Commander Ballard considers this to be the strongest that is likely to be formed against us, but does not at all despair of our own Navy being able to defeat the combination. He thinks that systematic attack upon British commerce would be the main object of the enemy, too weak to dispute with us the command of the seas. He attaches much importance to the question of coaling stations, and shows that nearly all foreign powers are deficient in these bases. The extent of the damage cruisers are likely to do to our commerce will, in his opinion, depend upon their capacity to obtain fresh supplies of coal and ammunition. He also thinks that foreign torpedo craft will do their best to sink and destroy our merchant steamers, but considers that a proper distribution of our own destroyers and light craft should put a stop to this. The essayist favours a system of pursuit of the enemy's vessels, rather than convoy or the patrolling of routes, and one reason which makes him believe this, is the decline of the sailing trade, and the increasing speed of steamships, which render our shipping less helpless than of old. The system of convoy, he considers to be a strong temptation to the enemies' torpedo boats to attempt attack, and in such a case, the presence of the shipping might hamper the convoying cruisers, and prevent them from firing on the enemy with safety.

Gunnery in the Navy.

An outcry has been raised during the month regarding the gunnery practice in the Navy, which, according to the official returns for the past year, are, to say the least, unsatisfactory. As might have been expected, the name of Lord Charles Beresford has been mentioned in the matter, and in Parliament he has moved for a return of British Gunnery Practice, with a view of obtaining a proportion of misses to hits. We all wish for good gunnery practice in the Royal Navy, but projectiles cost money, and therefore it is not pleasant to read of the extravagant proportion of misses to hits. An article in a contemporary seeks to prove that there is a deplorable neglect of gunnery practice in the Navy, and severely criticises the small proportion of actual hits registered by the largest types of guns. The article takes, as a case in point, 174 rounds fired from thirty-six 13·5 in. guns, and complains that only thirty-five hits were recorded, representing a proportion of 20 per cent. With the 6 in. quick-firing guns the same percentage of hits was obtained, the best results being obtained with the 10 in. guns, which scored 43·5 per cent. of hits. No official record is kept of the quarterly practice with the great guns, and the only clue we have as to the efficiency of our gunners in this direction, is by studying the results of the annual prize-firing. It is not quite fair to select certain ships as examples, for it often happens that the captain of a vessel does not take a great deal of interest in the gunnery training, which is therefore neglected to a certain extent. Expensive as the cost of practice with big guns is, it is a part of the training of our seamen which cannot be dispensed with. There may be room for improvement in naval gunnery, but if we are to believe foreign newspapers, our gunners are far superior to those of France, Russia, &c. A target is a very small thing to fire at, and if the proportion of actual hits registered on such a target is small, it may be expected that when the target is a battleship, the percentage of hits will be very much greater.

The Situation at Present.

Looking ahead, it seems that Spain will certainly be the loser in the struggle. Cuba will have to be abandoned, and probably Puerto Rico, and the Philippine Islands will only be retained by the payment of a tremendous war indemnity, if she is allowed to retain them at all. No relief expedition has left Spain as yet for the Philippines, and the American fleet are meanwhile comfortably installed in Manila Bay, waiting for the army of occupation to arrive, under General Otis. Havana may prove a hard nut for the Americans to crack, but that it will eventually fall is a certainty. The Cuban rebels do not appear to be nearly as strong as was reported, and it is a mystery, if this be true, why the Spaniards have not managed to wipe them out long ago. It has been stated that the war in Cuba has been prolonged by the Spanish army there, in order to keep the officers employed and their pockets well lined, but how much truth there is in this, it is impossible to say. However, Admiral Cervera's position is not vastly improved now that he has reached Cuba, and it is difficult to say what his object can be in taking shelter in Santiago Harbour, unless he is prepared for a decisive struggle with the American fleet. The fighting may have taken place before these lines appear, in which case Admiral Cervera is most likely to meet with defeat, unless he is reinforced, and the only reinforcements likely to reach him are the cruisers and the battleships now off the Spanish coast, and which there seems to be no hurry on the part of the Spaniards to send away. At the commencement of the war, comparisons of the two fleets were plentiful, and from these it seemed that they were about equal, but somehow or another, Spain's fleet now appears in a hopeless minority. This must be accounted for by the number of ships under repair, and the manner in which she is obliged to divide her forces. She is fighting 3,000 miles away from home, while the United States' vessels in the Cuban waters are able to reach their base in a few days. Whatever relief expedition may be prepared for the Philippines, it is unlikely that it will be allowed to pass through the Suez Canal, and the only other course is a long ene, necessitating the presence of numerous colliers and transports to accompany the relieving forces. The outlook for Spain is decidedly gloomy.

The Struggle between Spain and America.

One of the most important factors in the present war between Spain and the United States is the supply of coal for the fleets of the two countries. Admiral Cervera has managed to cross the Atlantic in safety, although he has had to leave the torpedo destroyer *Terror* at Fort-au-France, ostensibly with the object of having her machinery repaired. Many regard the alleged breakdown as a ruse to allow the destroyer to wait for the *Harvard*, which is also laid up with her machinery out of order. From telegrams received, it appears that an attempt was made to coal the *Terror* in the harbour, but this was prevented by the French authorities. Mr. Gibson Bowles was not far wrong when he said of the Spanish fleet "that when the time for action comes, they will be found without fuses fer their cartridges, without warheads for their torpedoes, and without coal anywhere where it ought to be." The organization of the Spaniards is well known to be execrable. Brave they undoubtedly are, but the old cry of "Manana" is heard too frequently, and until the Spaniards drop the policy of putting off till to-morrow what they can do to-day, there is little chance of improvement for them. Their antagonists are just the opposite, and are likely to be too hasty, if anything. The strategy of Admiral Cervera may be good, and there may be plenty of it, but a little fighting makes up for a deal of strategy, and the man who has to resort to strategy to save himself from destruction is in a bad way.

Portsmouth Dockyard.

No great change has taken place at this yard since it was referred to last month. Mr. Goschen paid the place a visit early in the month, with the object of ascertaining the progress of physical development in the stokers. He inspected all ranks, from the recruit who had freshly joined, to the man who had served a commission at sea. No doubt he gained all the information he required by the visit. Another item worth mentioning in connection with affairs here was the order of the Admiralty to economise the Welsh coal in hand, on account of the strike in Wales, and their order of the tugs and other yard craft to use one-third north country coal. The policy which the Admiralty have advocated in this case must be commended, for although there were some 20,000 tons in hand when the order was given out, this will not last more than three months. On account of this order, the torpedo-boat destroyer *Sylvia* was not able to successfully carry out a 3-hrs. 30-knot trial, although she made four attempts at it. The coal used was the hand-picked coal from the dockyard stocks, but the quality of this coal was not of the best, and, therefore, the *Sylvia's* trial has had to be postponed until the strike is over. It is perhaps worth mentioning that the visit which the Duke and Duchess of York paid to this yard was not accompanied by the usual round of banquets, balls, concerts, speeches, &c. Many alterations will of course be made in the *Crescent* before His Royal Highness hoists his flag on her, but these alterations will not be quite finished until early in the present month. The cruiser *Marathon* is to leave for the East India Station on the 2nd of this month. A trial of her machinery was made which was most unsatisfactory on account of the priming of her boilers. In the *Marathon* the refit has been pretty extensive. Her boilers have been retubed, and her engines opened up and overhauled. New dynamos and electric-light machinery have been fitted, and her large guns converted into quick-firers.

Chatham Dockyard.

Repairing and refitting has been the chief work of the past month at this yard. On examination it was found that the boilers of the *Mersey* were in such a defective state that they needed a thorough overhauling. She will be dismantled and placed in the C division of the dockyard reserve for this purpose. Some £13,000 was spent upon her only two years ago. The *Terpsichore* and the *Endymion* are being prepared for the manoœuvres, and are having their defects seen to with all possible expedition for this purpose. The same applies to the *Tribune*, *Theseus*, and *Spitfire*. Commissioning of the *Illustrious*, *Dido* and *Isis* was the cause of much work and bustle, but showed up strongly that the Medway Reserve is not large enough to stand such a demand for men, and conseqnently a deficiency has to be made up by calls on other ports. The *Irresistible* continues to make excellent progress, and if she continues at the present rate, will be ready for launching before Christmas. This rapid progress is due to the fact that so much material was prepared before she was officially commenced. Early in the month some delay was experienced in consequence of deliveries of material being behindhand. As regards the *Vindictive*, she is making a rapid progress towards completion, and it is calculated that her official trials will take place early in July. If possible, she will be got ready to take part in the manœuvres. In any case, she will be ready for commission at the end of the financial year. The *Goliath* is also receiving a good deal of attention, and nickel steel armour-plates for her are continually arriving and being placed in position. The trials of the *Tartar* are said to have been of a highly satisfactory character, her machines having answered well under both natural and forced draught. Her engines were taken to pieces and thoroughly overhauled and repaired. Much other refitting and repairing work is in hand. It is proposed to fit entirely new propelling machinery to the *Dreadnought*.

Devonport Dockyard.

It is to be feared that many refusals will have to be made for admission tickets to this yard to see the launch of the *Ocean* or July 5th. The *Psyche* will be launched not long afterwards, thus leaving vacant one open slip and a shed. The first-named will be immediately occupied by the *Implacable*. Reference has already been made to the farce of putting a vessel in hand and yet not commencing her. The launching weight of the *Ocean* will be over 7,000 tons, but no anxiety is felt by those responsible for the launch, as to her safely taking the water. Vessels which will be temporarily commissioned during the naval manœuvres are occupying a good deal of attention, and much other refitting work is in hand. It is pleasant to be able to say that Keyham factory has proved to be a success, and it is now one of the chief establishments of the kind under the Government. In the course of the past ten years enormous sums have been spent on new machinery and the orders which have been carried out. Orders for water-tube boilers have been sent in much faster than they can be executed, and the first order for Belleville boilers has now been received at Keyham factory. A new set of machinery for the construction of Belleville boilers for the *Rosario* has been acquired. The new cruiser *Furious* is to be commissioned at this yard on the 30th inst. She is to go to sea as a part of the Channel Squadron. It is calculated that her cost has been over £285,000, including the cost of the numerous steam trials she has made. It was to have been completed last December, and if this had been the case, her cost would have been some £10,000 less. A new paddle-tug is to be added to the service this year, and she is to be the most powerful tug in the British Navy, and will be an improvement on the *Dromedary* and *Escort*. Her engines are to develop 1,500 I.H.P., with a speed of over 12 knots. She will cost about £27,000. About £33,000 has been spent on refitting and reboilering the torpedo-gun boat *Salamander*. Water-tube boilers of the Mudford type have been put into her, and she is to undergo a series of experimental trials with the object of ascertaining whether these boilers are suitable for this type of ship.

Sheerness Dockyard.

Considerable activity reigns in all departments at this yard. The torpedo-boat destroyer, *Angler*, has completed her full-power trial, prior to the acceptance of her machinery from Messrs. Thornycroft. The specification called for 5,400 H.P., but this was exceeded by over 400. Her average speed was 29·897 knots. After only three months service the *Speedy* has once more struck her pennant, on account of her boilers having given out while on her way to reinforce the Mediterranean Squadron. She will now undergo a thorough overhaul. Her water-tube boilers will be refitted, the tubes to be made at the Keyham factory. The cruiser *Pomone* continues to make good progress. Her engines are being supplied by Messrs. John Penn & Sons. If the *Proserpine* comes through the whole of her trials in a satisfactory manner she will be ready for the pennant at the end of this month. The new sloops, *Condor* and *Rosario*, are also making good progress. Tenders for two sloops of a similar description are shortly to be invited, and the drawings for these are now being prepared. It is expected that the cruiser *Perseus* will arrive at this yard from the contractors about the middle of this month. Her completion has been considerably delayed by the dispute in the engineering trade. In the ordinary course of events she would have been finished for commission two months ago. She will displace 2,135 tons, and will have engines of 7,000 H.P. with forced draught, and 5,000 H.P. with natural draught.

Pembroke Dockyard.

The three ships which are building at this yard, *Andromeda*, *Spartiate*, and the Royal yacht, all continue to make fair progress. As regards the last-named, it is proposed to fit her with a new style of coaling port. This has been constructed, and if approved of, will be fitted at once. Her phosphor-bronze model, weighing about 15 tons, has been successfully cast at the yard foundry. A movement is on foot here, whereby several smaller building slips will be adapted to present-day requirements, and their size increased, so as to permit the largest size of vessel to be built in them. There are only two slips here at present available for the building of first-class battleships. If these slips were enlarged, it would also be necessary to enlarge the dry dock, so as to prevent ships having to be sent away to other yards in an incomplete state. It is worth while pointing out here that although the launching weight of the *Ocean* is expected to be quite 7,000 tons, the *Hannibal*, when launched from this yard, weighed 7,950 tons, including the weight of her launching cradle. As far as is known, this is the heaviest battleship ever launched.

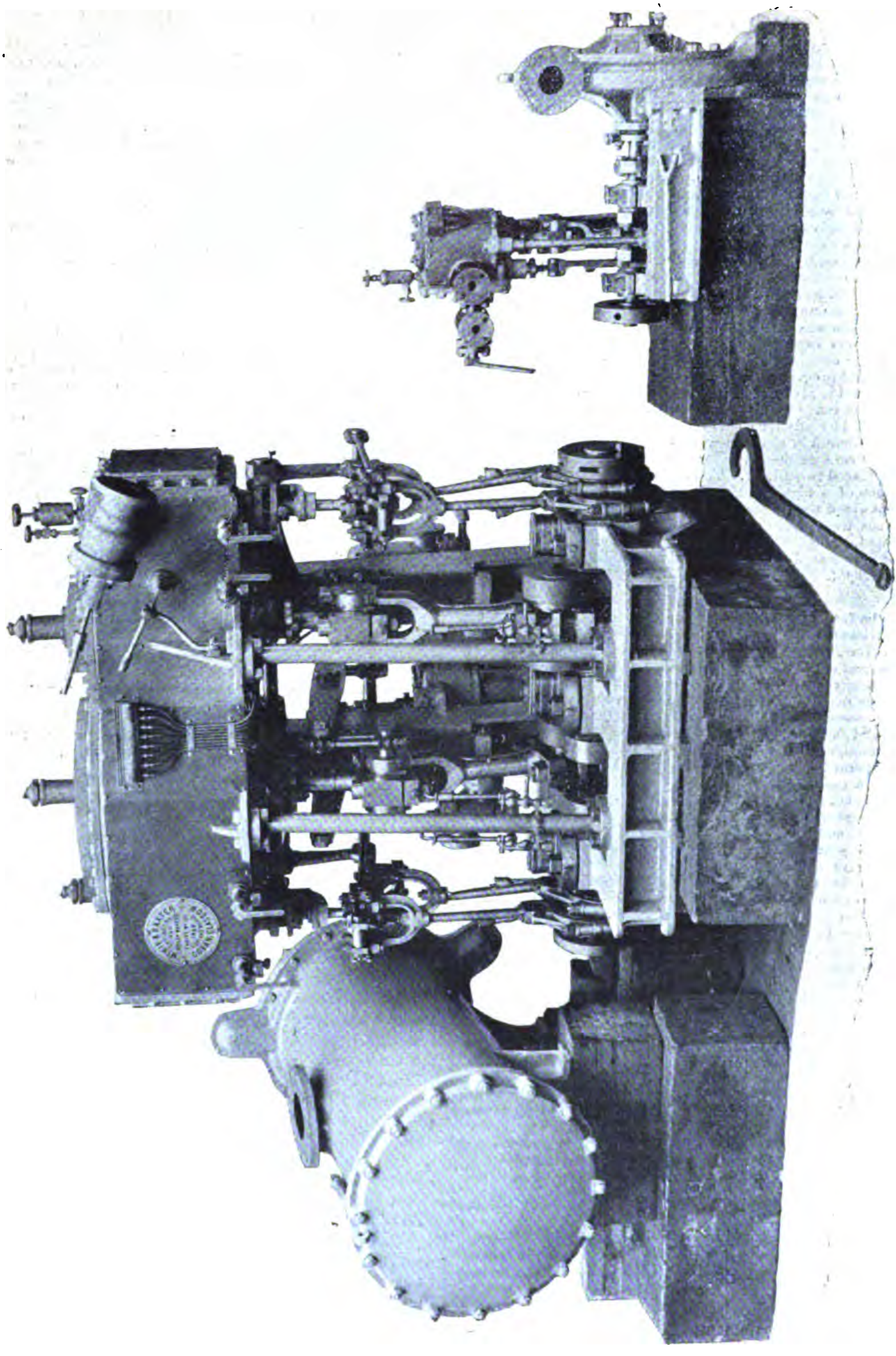
ENGINES FOR HIGH-SPEED STEAM LAUNCH.

On page 106 we illustrate a set of compound surface-condensing engines, which have recently been fitted by Messrs. McKie & Baxter, Copland Works, Govan, on board a small steamer of good speed built at the yard of Mr. T. B. Seath, Rutherglen. From the illustration given it will be seen that the condenser, which is of cast-iron, is independent of the engines. Shown alongside the engines also is the circulating pump appertaining to the installation.

The engine has cylinders 10¾ in. and 23 in. diameter by 12 in. stroke. The air-feed and bilge pumps are worked by levers from the low-pressure cylinder. The centrifugal circulating pump is one of the makers' 3-in. Baxter's patent "Challenge" type, a special feature of which is a balanced valve, the invention of Mr. Baxter, to which fuller reference will be made in a future issue.

The boiler, which we shall illustrate in our next issue, supplies steam to these engines at 150 lbs. pressure. It is 8 ft. 3 in. in diameter, and 8 ft. 6 in. long, and has two plain furnaces 38 in. inside diameter. The grate area is 26½ square feet, and the total heating surface is 420 square feet. The boiler was built under Lloyd's survey.

The little steamer on which the engine and boiler were fitted is 60 ft. in length, 12 ft. beam, and 5 ft. mean draught, and was tried for speed on the 18th ult. in the waters of the Gareloch, going and returning under steam from Princes Dock, Glasgow. With the exception of about half-an-hour the steamer was



Engines and Centrifugal Circulating Pump for High-Speed Steam Launch.

kept going full-speed for the whole period, from 10 a.m. till 7 p.m. The mean of several runs over the measured mile showed that the speed was a little over 11½ miles per hour. Everything worked most satisfactorily, the main engine making 180 revolutions per minute. Over the whole period of running the "Challenge" pump—which made, in round numbers, half-a-million revolutions—worked without hitch or hindrance.

This forms the fifth set of machinery Messrs. McKie & Baxter have made for the same owner.

IMPORTANT DEVELOPMENTS ON THE MANCHESTER SHIP CANAL.

SEVERAL important undertakings are either approaching completion or in progress, both in connection with the general equipment of the Manchester Ship Canal and in other directions, which will contribute towards a largely-increased carrying trade, and also towards a development of industrial enterprise and activity in the district. Amongst the most important of these is a large grain elevator and silo, now nearly completed, which has been erected for the Ship Canal Warehousing Co., by Messrs. John S. Metcalf & Co., Chicago, on American lines, and capable of storing 40,000 tons of grain. Adjoining this elevator a large malting-house is now in course of erection, into which the grain will be delivered direct from the elevator, and this, it is anticipated, will result in establishing a considerable malting business in the neighbourhood.

Important dock-shed and warehouse extensions are also in progress. A new shed warehouse, with four floors, each having a storage capacity of 7,000 tons, is in course of construction. This shed is fireproof throughout, with Goulden's patent floors, built with curved channels, with expanded metal inserted in the concrete, and it may be mentioned that this is the first time these floors have been applied to any really large work, the patent floors which are being put down in the new shed covering an area of about 25,600 square yards. Important alterations have been carried out in the old three-story sheds at the docks by extending the second and third floors over the loading ways, which were previously simply covered in by glass, and by this enlargement an additional storage area of about 7,000 square yards is being obtained. The Transport Co. are also preparing to build a large warehouse on the Trafford Park Estate, but in direct connection with the Ship Canal by means of transports.

Ample provision is also being made for developing an important oil trade on the Manchester Ship Canal, large storage tanks having been erected at Mode Wheel by the Manchester Corporation, the Liverpool Storage Co., and Messss. Bagnall; whilst at Eccles the Anglo-Caucasian Oil Co. are erecting large oil tanks. At the whole of these tanks the oil is pumped direct from the tank steamers that come up the Canal. Other important work at Mode Wheel is a doubling of the sidings capacity to meet the requirements of the rapidly growing trade, by extending the gridiron, which has now storage for 500 waggons.

The latest and amongst the most important extensions of the Manchester Ship Canal is the very successful flotation of the Manchester Liners, Limited, which will establish an important special line of steamers for the Manchester Docks. The company, in accordance with previous arrangements, have already purchased a couple of steamers, so that business might be commenced at once, and in the meantime larger steamers, of about 9,000 tons capacity, are being built. The first of the purchased steamers, the *Parkworth*, with a deadweight tonnage of about 5,000, is now on its journey from Montreal with a large cargo of general goods, and between 300 and 400 cattle for the Manchester Docks.

The Canadian Pacific Railway.—Mr. J. W. C. Haldane, C.E., of Liverpool, is leaving there on June 2nd, by the new Dominion liner *Dominion*, for a tour in Canada, with the object of gaining special information regarding the Canadian Pacific Railway system, whilst travelling over its whole area as far as Vancouver. The knowledge thus obtained of the line, the country through which it passes, and its steamship connections with England, Japan, and Australia, is intended for future use in new literary and lecturing projects.

CAIRD & RAYNER.

IN 1894 we gave a short illustrated article on the works of Messrs. Caird & Rayner, at 777, Commercial Road, Limehouse; but as they have been more than doubled since, we will now describe the new arrangements which they have made for meeting the increasing demands for their apparatus. There is now a large and imposing building at the front of three stories. The building accommodates the clerks' office, the drawing office, the pattern-makers' shop, new stores, and other offices.

The drawing office is fitted with drawing tables at the front windows, and with tiers of drawers at the back, the floor being fitted with parquet flooring. The pattern-makers' shop is fitted with every modern appliance for the quick manipulation of wood. One machine for cutting the ends did it with great cleanness to any angle, no plane being required at all to touch it up after.

The old workshop is of large floorage, in two flats, fitted up with lathes, planing machines, drilling and milling machines. One of the planing machines is of a novel kind, as it cuts parallel to the frame and at right angles to the direction in which a shaping machine performs its work. One notable thing in this shop was a stud-making machine. A young lad fixed the steel rod from which the stud was to be made, and then, with one cut of the screw, finished it. A square-faced cutting tool, in a fixed position, was then brought forward and separated the stud from the rod. The whole operation was completed in about two minutes. Indeed, it may be said that the special features of the works were their tidiness and the systematic way in which everything was done by everyone, from the chiefs to the errand boy. Nothing appeared to be left to chance. Every workman appeared to know exactly what he had to do, and did it with expedition and without the least hesitation.

The new erecting shop, of which we give a photograph (Fig. 1), is a very large and roomy place with electric travelling crane capable of raising 10 tons. It runs the whole length of the shop, and it was lifting a large evaporator when our representative was present. In the erecting shop there were also various machine tools, lathes, planing machines, &c., all of a very modern design. At the end of the erecting shop in the basement is the engine and dynamo room. There are two engines, one large gas engine and one dynamo, which supplies current to turn all the machinery, and a small gas engine and dynamo to supply sufficient current for one or two shops when there is a night shift. Each main shaft throughout the building is attached to an electric motor, which can be simply switched in and out with ease. The testing-room is a model of neatness and order. An evaporator and condenser, with pump and all other attachments fitted, is standing to be tested by the Inspectors of the Admiralty. For testing purposes there are two water-tube boilers to supply steam, and numerous tanks for holding water, with gauges fixed to them, so that the quantity of water taken may be read off at any time. In another room in the basement there were great rows of tanks with salt water for other tests. Still another room is used as a pattern-store, The coppersmiths' shop is in the old part of the works. Part of the erecting shop is walled off for brazing and smiths' forges, so that all obnoxious fumes are carried away.

Messrs. Caird & Rayner make specialities of evaporators, condensers, feed-heaters, and pumps, and they have done a very extensive business with the British, Russian, Austro-Hungarian, Netherlands, Japanese, and also Australian Governments. They have also fitted up a great number of plant in the Donald Currie, the Peninsular and Oriental, and many other large lines of steamers.

Messrs. Caird & Rayner's New Erecting Shop (Fig. 1).

The firm at the present day is paying special attention to feed-water heaters, of which they make two kinds. One type uses live steam while the other uses exhaust Both live steam and exhaust are sometimes used. The live steam feed-water heater consists of a cylindrical vessel of cast or wrought-iron, inside which is placed a series of coils of seamless copper tube. The heater is placed so that the feed-water is forced through it on its way to the boiler from the feed-pump. Live steam at full boiler pressure is admitted to the coils at the top, and, passing through them, leaves at the bottom at a temperature little in excess of the entering feed-water. This condensed steam from the coils is pumped back into the boiler. Provision is made at inlet and outlet branches of the feed-water to take its temperature, and a spring loaded relief-valve is fitted inside of the shell as required by the Board of Trade. The joints of the tubes, with the tube plates end of the heater, are of a peculiar and simple patented construction. A hexagon in the union fitting into a suitable recess in the tube plate prevents fracture of this tube in screwing up. The joint is made by a cone on the union against the edge of the hole in tube plate—practically a valve joint and perfectly tight—without any paint or putty.

The exhaust steam in non-condensing engines can be used for heating the feed, and the firm have designed a feed-water heater suitable for its use. The temperature of such exhaust steam is about 250 degs. F., and much of the heat in such can be communicated to the feed-water. This heater consists of a cylindrical vessel, usually of cast-iron, having a cover bolted on either end. One cover is connected to the exhaust pipe, and the feed-water heater thus forms part of the exhaust-pipe. The exhaust-steam thus circulates amongst the tubes inside the heater through which the feed-water circulates. These tubes consist of a series of seamless copper tubes jointed into suitable connections for inlet and outlet of the feed water.

For making up the feed which is lost by leakage, for producing drinking water from salt or brackish water, evaporators and condensers are extensively employed. The evaporator consists of a large wrought-iron cylindrical vessel with an opening in front nea the bottom on which is placed a door. Suitable passages are cast in the door, and to these a series of horizontal volute coils are attached at their outer ends, their inner ends being connected by suitable connections, so that the series forms practically one long tube to which the boiler steam is admitted to evaporate the sea water surrounding the coils in the evaporator. The vapour produced is led to the main condenser or to a distilling condenser, where it passes through a number of coils of tube surrounded by circulating water, and is so condensed, and then pumped to tanks, &c., as required.

The firm make a great number of types of this plant for different purposes. One simple type, producing 25 gallons an hour, has been sent to the Colonies. It consists of a boiler designed to be of easy access in all parts for easy cleaning, since the salt and impurities are left in it and have to be cleaned out at intervals. It consists of a cylindrical shell, having a brick-lined wrought-iron casing, which forms the furnace underneath. The pump is fixed in the outside shell, and takes its suction-water from the water direct or from a tank. There is a surface condenser connected to this plant which can be placed in a tank or reservoir of cold water. The whole plant is mounted on wheels, and portable, with shafts for horse haulage.

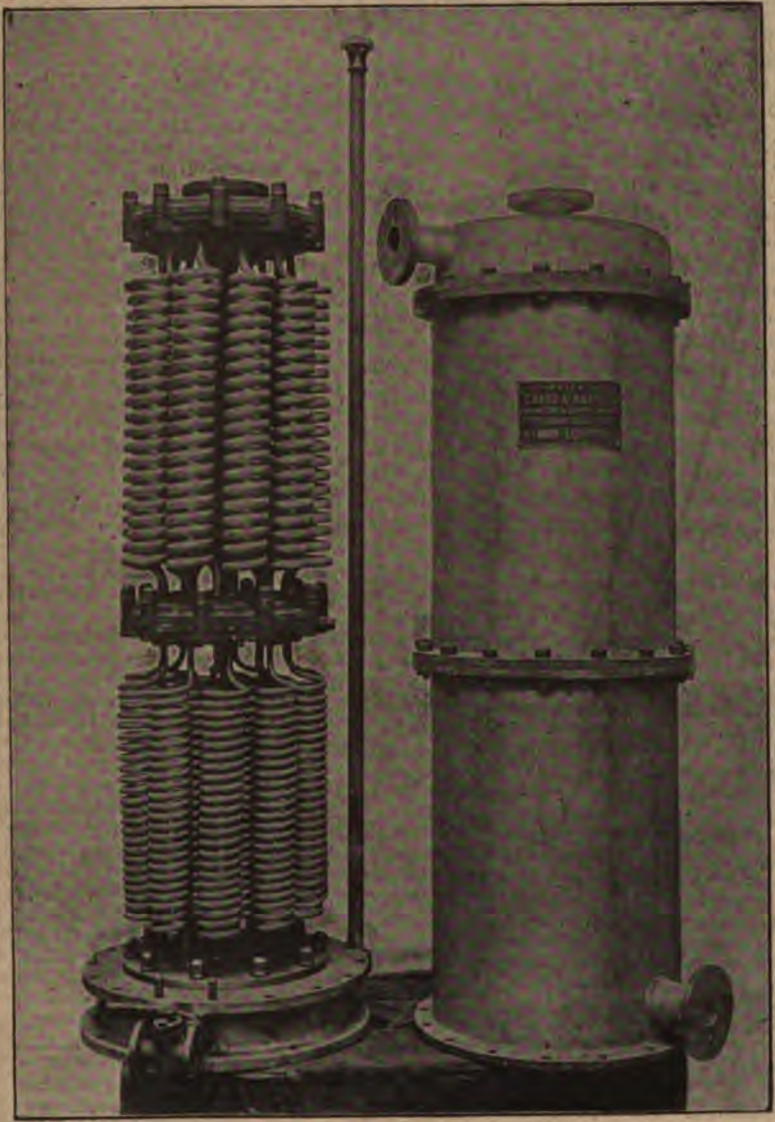


FIG. 2.

Another portable plant of larger dimensions, capable of producing 100 gallons per hour, is made by the firm. In this case it is arranged that all steam taken from the boiler is returned to it as feed-water. The boiler in this plant, if filled with pure water at first, requires no cleaning. Any loss from leakage can be made up by adding a little to the hot-well from the storage tanks. Another type is for using with a non-condensing engine, and fixed on wheels, so can be used with a portable engine. Another is capable of producing 250 gallons of pure water per hour from very impure water, special arrangements being necessary to ensure continuous working of the apparatus.

An interesting feature of the coils of tubes in the evaporator is their possession, in virtue of their shape, of self-cleaning properties. They are of the helical form and this gives them great elasticity, so that they expand and contract by the heat or the cold. This action causes the scale, which naturally is deposited on the coils, to be thrown off and fall to the bottom of the evaporator.

To provide for the level of the water in the evaporator being kept constant an automatic feed inlet-valve is fitted, which has been found reliable.

One notable thing in the shops was the ease with which large copper tubes were being bent into the spiral form on a turning table made to rotate slowly. This used to be done by first filling the tube with rosin, now it is done by filling the tube with water at high pressure. The table caught the tube in the centre, kept winding it round, while a lad kept hitting the tube down flat. The tube was not in the least flattened during the operation, although a considerable pressure must have been exerted between the two sides of the tubes touching each other.

STETTIN DOCK.

THE dock has been built to the order of the Stettinei-Maschinenbau-Actien-Gesellschaft "Vulcan," the well known shipbuilders and engineers, of Stettin, and to the designs of Messrs. Clark & Standfield, of Westminster, the eminent dock engineers, and embodies all their latest improvements in their self-docking pontoon docks. The Vulcan Co. recently built one of the fastest Atlantic liners in the *Kaiser Wilhelm Der Grosse*, and the same company are now constructing a still larger and faster vessel for one of the great German lines. This dock has been constructed with special reference to the lengthening and the re-engining of two large Atlantic liners owned by the Nordeutscher Lloyd Co. The principal particulars are:—Length overall, 510 ft. 9 in.; breadth extreme, 110 ft. 9 in.; height from bottom of pontoon to top of walls, 43 ft. 7 in. The internal width is sufficient to allow vessels up to 82 ft. beam to be docked, and the depth over the keel blocks is 24 ft. The maximum lifting power is about 12,000 tons. The machinery consists of two sets of compound engines 125 H.P. each, and two boilers of the marine type in each wall. Each engine is connected to two 15 in. centrifugal pumps, and the entire machinery is capable of lifting a ship of about 11,000 tons displacement in 2½ hours. The dock as a whole is divided into 38 water-tight compartments each filled or emptied by separate valves and controlled from a valve house on the top of each wall. The dock is what is known as the self-docking type, that is to say, access to all the external surfaces is possible either for painting or repairs. The dock longitudinally consists of two side walls, between which are connected three pontoons, the centre one being 240 ft. long, and the two end pontoons 135 ft.

The sub-contractors for the machinery are the Wallsend Slipway and Engineering Co., Limited, who are responsible to the builders for a complete installation of machinery suitable for working the dock. The engines and the pumps were made by Messrs. Gwynne & Co., of Holborn; the valves by Messrs. Blakeborough, of Brighouse; and the boilers by Messrs. Riley Bros., of Stockton.

The contract for this Dock was signed on the 23rd of October, 1897; the first plate was laid on the blocks on the 17th November, so that from the time there was any visible progress made to the date of the launch, six months have elapsed, which beats the performance in the case of the Havana Dock. That dock was seven months in course of construction from the date of laying the first plate to the date of the launch, and the Stettin Dock exceeds the length of the Havana Dock by 60 ft.

During its construction, in addition to the supervision of the designers, Messrs. Clark & Standfield, the dock has been under the close personal supervision of Mr. Otto Haack, one of the assistant managers of the Vulcan Co., who has been assisted by an adequate staff of assistants.

Reviews.

Brassey's Naval Annual.

UNUSUAL interest naturally attaches to the publication of this now Standard Annual Publication for the attention which is turned to Naval Matters by the contest now raging between Spain and the United States. The references to this actual matter in the volume are naturally few enough. The loss of the *Maine* in February, is probably the last event noted in the annual but the Editor speaks of "the considerable efforts which Spain has made to face the difficulties in the Caribbean Sea in consequence of the situation in Cuba," and his remarks on the American Navy are fuller, but they hardly lead us to the conclusion that he anticipated that even his words were published a naval war would be actually in progress.

We have read in the recent reports of the capture of merchantmen by United States warships that "Ensign so-and-so sprang over the taffrail." The rank is unknown in the British Navy. It is therefore interesting to learn that "The naval cadets have to go through four years' instruction in a Naval College before being promoted to be ensign. Every ensign must be capable of taking charge of a watch on deck or in the engine-room, the Americans believing that every naval official should be both a sailor and an engineer." This double qualification has only recently been insisted upon, and if the system has been sufficiently established to be in fair working order now, it will be interesting indeed to see if such an arrangement proves satisfactory under the conditions of actual warfare. A quotation is given from the *Illustrated American* as to the sea kindliness of the vessels of the Atlantic squadron. From it we learn that the *Indiana* did badly in a storm from excessive top-hamper and too heavy guns. She actually rolled her turrets loose. The *Marblehead* and the *Amphitrite* (a low free-board monitor) also did badly, but the *Columbia* and *New York* stood the weather test well. In another part of the volume we read that the United States Government could hardly be supposed to intend to let the *New York* do any serious work before her 4-in. quick-firing guns were replaced by some of heavier calibre. The *New York* is certainly doing serious work, and if the highly imaginative correspondent of the *Times* who is on board of her is to be believed she still carries 4-in. guns.

Turning now to matters of interest neared home, we find that a very interesting account of Mr. Parsons' experiments with the *Turbinia* is appended. The new and ingenious type of river-steamer recently added to the Navy is somewhat minutely described, and the vexed question of water-tube boilers thoroughly ventilated. The importance of simplicity in construction and detail is rightly dwelt upon, and there is no doubt that in the heat of battle confusion is apt to arise—even amongst highly disciplined men—and at best this means waste of time which may be priceless. So, too, is the damage of woodwork—already taught us in the Yalu and Manilla fights—again emphasized. In our own fleet the *Canopus* class seem to meet with the approval of the Editor. This reminds us that the Brassey's have, as a family, urged the restriction in size of battleships. Their objection to big ships extends to the big cruisers *Powerful* and *Terrible*, whose building they believe to be due to a mistaken view of the terror of the Russian *Rurik*. It is not owing to her boilers that they are, according to the Annual, foredoomed to failure but to their size, which forbids their entrance to so many docks or harbours, and to the huge complements they require. It is prophesied that they will prove the *Shah* and *Inconstant* of our day. The Editor characterises the short expenditure for shipbuilding of last year as most unfortunate, in view of the efforts that are being made in France, Germany, Russia, and the United States to increase their naval strength. He could scarcely do otherwise, especially as he devotes a new chapter by Mr. Charles Gleig to the question of Britain's food supply in war time, a question so prominently brought to our minds by the rise in prices which has occurred during the last few weeks. An interesting series of statistics are appended. From them we learn, that in 1841, 24,230,000 of our population were dependent on home grown wheat as against 7,000,000 in 1897. Whilst those dependent on foreign grown wheat have increased in the period named, from 1,200,600 to 33,000,000. Comparing 1891 with 1871 we see an increase in the dead meat imports of 392 per cent., whilst that of wheat has increased 68·3 per cent. This is rightly consdiered a question of vital importance to the nation, and the food riots on the Continent will make thinking men pause. A stronger argument for keeping up the Navy could not be imagined.

The usual tables of vessels, artillery, and armours are appended. In the latter we would suggest a slight amendment in future issues. As we regard the tables, the guns on our left hand pointing at the various thicknesses of armour. Yet the thinnest of armour—that which will not withstand the smaller guns, is placed to the right, and the thicker and less piercable nearer the guns. Surely it will be more logical and convincing to rearrange them and place the thickest furthest away, putting that which can be penetrated first nearest the weapons. It is a small matter but such details are worthy of attention in so complete and exhaustive a reference—book as the present.

Messrs. Crosby, Lockwood & Sons send us a neat and well-bound volume containing a list of the very numerous publications which they issue. Weale's well-known series of scientific works is included, and that is, of course, a library in itself. But there are many other volumes included in this catalogue. These deal with the arts, science, commerce, Agriculture, electricity, and engineering, and even with the law of the day. Many of the books classed under other subjects, of course, come very much into the view of the MARINE ENGINEER. But in his own peculiar list he will find such aids to his work as the useful pocket-book of Mr. Clement Mackrow, Proctor's Marine Engineers' Pocket-book, and Mr. Urquhart's handbook on electric ship-lighting, with others.

Sketches of Engine and Machine details, by Wallace Bentley, Halifax: F. King & Co., 1898.

IT is quite unnecessary for us to dwell on the importance which the art of drawing plays in the education and work of engineers. The student finds the necessity of learning drawing—and that in the conventional way which has been arrived at by the combined experience of the profession into whose ranks he strives to place himself—at the very outset of his career. This little work will be very likely to prove of value to him in whatever branch of engineering he may eventually take his place. The drawings are very clearly and simply set out, with full explanations and acknowledgments of the numerous and diverse sources from which they have been derived. Railway, ships, steamship companies, offices, shipyards, lofts, and the Science and Art Departments have all been laid under contributions for the little volume, which will no doubt attain the large measure of success which has attended Mr. Bentley's previous excursions into authorship.

The Junior Photographer for May, 1898: London. Percy Lund & Co.

THE Editor of this magazine—which professes to be chiefly for novices—manages in a wonderful way to keep up, and to increase the value of his work as the months go by. The present issue contains a reproduction of a very beautiful cottage interior as a frontispiece. We are astonished to note that the date is "1874," and that the picture was taken on a wet plate. It is obvious that a good workman could do excellent work even a quarter of a century ago and that the improvements in material of recent years have not so much raised the record of performance to masters as they have enabled the ruck of amateurs to bring the general level of their work nearer and nearer to the best productions of the day. An *à propos* article for the early summer is that which gives useful hints as to the management of the camera for athletic purposes.

The Practical Photographer for May, 1898: London. Percy Lund & Co.

THIS monthly journal deals with the higher applications of photography. Here we have an interesting mathematical discussion on the focal length of compound lenses and an historical view of the earlier attempts at portraiture as produced in the Early Sixties. Many of the pictures look as though they were from the album of John Leech or represented characters from the successful modern play "Trelawny of the 'Wells.'" The suggestion of the use of the camera for portraiture sketches is a very pretty idea and the accompanying blocks make very beautiful pictures. The range of power to the modern artist in light seems unlimited. It needs such a work as the present to be constantly in one's hand to grasp realise how much progress this art is making month by month.

Hints on the Legal Duties of Shipmasters. By Benedict W. Ginsburg, M.A., LL.D. (Cantab), Barrister-at-Law. London: Charles Griffin & Co., 1898.

THIS is a very concise and well arranged little volume, which is published as one of Griffin's Nautical Series, edited by Edward Blackmore. It may be justly termed a handbook written in clear and non-technical language, and is intended as a simple means for the young sailor to gain a knowledge of the elements of his profession by private reading and without difficulty, so as to enable him to direct his conduct when out of reach of other advisers. As the author has frankly stated in the preface, it is no attempt to make every shipmaster his own lawyer. Such an endeavour would no doubt be a hopeless task and could not in any way benefit the shipmasters' profession in any reasonable degree.

In the first place the author deals with the qualification for position of master and sets forth the essential features which have any bearing on the point. He then proceeds to discuss the contract with the owner, detailing what he may and may not do, and for what offences he may be discharged. The master's duty in respect to the crew is then touched upon with regard to engagement, apprentices, discipline, provisions, accommodation, medical comforts, and the payment of wages and discharge. The next important subject set forth is the master's duty in respect of the passengers, which is gone into with much sub-division of heads. A short statement is made of the master's financial responsibilities, and a longer one is made with reference to the master's duty in respect of the cargo. The following subjects are then dealt with in some detail: The master's duty in case of casualty, and in regard to certain public authorities, in relation to pilots' signals, flags and light dues, and upon arrival at the port of discharge.

Appended at the end of the book are the requirements as to sea service previous to examination for Board of Trade certificates of competency, subjects for examination for same, suggested clauses to be inserted in master's agreements with shipowners when engaged on "Investment Terms," regulations as to keeping order in passenger steamships, the dietary scales, scale for determination of the length of voyages by passenger vessels, the stowage of grain cargoes, regulations as to life-saving appliances, load-line regulations, the regulations as to carriage of cattle at sea, and as to the importation of dogs, and last, but not least, as to marriages, etc., on board ship.

We are quite certain that most shipmasters will find this little book a very valuable and useful addition to their library afloat, not only on account of the simple method adopted in dealing with the subject, but also for the confidence which it will inspire him with should he be called upon to decide an important matter, at a time when he has only himself to rely upon.

Industrial Electricity. By A. S. Elliott. London: Whittaker & Co. 1898.

THIS little volume is translated from the French of M. Henri de Graffigny. In translating the opportunity has been taken to, as far as possible, adapt the contents of the book to the new class of whom it aims at reaching. The book is intended to form the first of a series of popular books upon electro-mechanics, and it therefore deals generally, if not very exhaustively, with the whole range of the subject. It aims at giving in fact an intelligent outline of the whole subject which will be dealt with in detail in later volumes. Where we find a short chapter here, other hands will later on supply a whole book. The idea seems a good one, and it is certain that the author and compiler has given a useful popular account of the present state of the knowledge in regard to electricity and of its application to the service of man. They have succeeded in doing so without dipping deeply into mathematical matters and have put their information in a lucid and agreeable form.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from April 26th to May 24th, 1898:—

Abbott, William J., fleet engineer to the *Rodney*.

Adams, W. H., chief engineer to the *President*, additional, as resident overseer at Woolwich, to date April 15th.

Agnew, John W., staff engineer to the *Dido*, to date May 10th.

Ainsworth, Frank S. (probationary), assistant engineer to the *Marathon*, to date June 2nd.

Baker, F. J., artificer engineer to the *Mersey*, to date May 10th.

Bath, F., assistant engineer to the *Illustrious*, to date May 10th.

Beal, William E., fleet engineer to the *Pembroke*, additional, for the *Dreadnought*, to date May 2nd.

Beckett, William H., engineer to the *Wildfire*, as assistant to chief engineer for charge of drawing office.

Bills, Walter W., assistant engineer to the *Crescent*, to date June 8th.

Black, William J., chief engineer to the *Victory*, additional, for the *St. George*.

Bluett, Peter W. P., assistant engineer to the *Benbow*, to date May 10th.

Brown, William J., staff engineer to the *Pembroke*, for the *Ajax*, to date April 26th.

Brown, Thomas F., fleet engineer to the *Victory*, additional, for charge of reserve workshops, &c., to date May 5th.

Burner, Alfred, engineer to the *President*, additional, for temporary service at the Admiralty.

Carruthers, David J., engineer to the *Illustrious*, to date May 10th.

Chamberlain, E. W., assistant engineer to the *Hannibal*, to date May 10th.

Chapman, William P., chief engineer to the *Vivid*, additional, for the *Sybille*, to date April 28th.

Chilcott, W. W., inspector of machinery, to be chief inspector of machinery in Her Majesty's fleet.

Chilcott, William W., chief inspector of machinery to the *Hibernia*, additional, for the reserve at Malta, to date April 1st.

Coad, Hamilton J., engineer to the *Victory*, additional, for service in the reserve, to date May 5th.

Colquhoun, William G. (probationary), assistant engineer to the *Dido*, to date May 10th.

Coopper, Herbert, engineer to the *Victory*, additional for the *Chamois*, to date June 2nd.

Denson, H. R., assistant engineer to the *Illustrious*, to date May 10th.

Drought, A. E., assistant engineer to the *Hannibal*, to date May 10th.

Dunn, Charles F., engineer to the *Cambridge*, to date April 23rd.

Edgar, Edward J., acting chief engineer to the *Pembroke*, additional, for the *Brisk*, to date May 1st.

Edwards, Walter, engineer to the *Victory*, additional, for the *Lightning*, to date May 5th.

Featherstone, Walter J., staff engineer to the *President*, additional, as engineer overseer of gun mountings at works of Messrs. Vickers, Maxim & Co., Barrow-in-Furness.

Fincham, W. C., fleet engineer to the *Victory*, additional, for the *Orlando*, to date May 12th.

Frost, James J., fleet engineer to the *Cambridge*, additional, for the *Hecate*, to date April 28th.

Fryer, George H., engineer to the *Marathon*, to date June 2nd.

Gilbert, James H., fleet engineer to the *Howe*, additional, for Haulbowline yard, temporary, to date April 23rd.

Glasspole, William H., engineer to the *Isis*, to date May 10th.

Godbeer, Samuel, chief engineer to the *Victory*, additional, for Portsmouth Dockyard, to date April 25th.

Grant, W. H., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Hammond, Leonard H. P. (probationary) assistant engineer to the *Isis*, to date May 10th.

Hawkins, H., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Highton, Francis W., chief engineer to the *Pembroke*, additional, for Chatham Dockyard, to date April 25th.

Hird, James, engineer to the *President*, additional, for service at Woolwich, to date April 25th.

Hocken, William T., chief engineer to the *Isis*, to date May 10th.

Hore, F., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.

Huddy, Charles J., engineer to the *Hannibal*, to date May 10th.

Humphreys, Henry, chief engineer to the *Pembroke*, for the *Comus*, to date May 19th.

Hurst, Isaac E., fleet engineer to the *Illustrious*, to date May 10th.

Johnston, J., engineer R.N.R., to be senior engineer.

Jones, Richard W., chief engineer to the *Marathon*, to date June 2nd.

Kitching, H. W., assistant engineer to the *Illustrious*, to date May 10th.

Leahy, Wilton P., acting chief engineer to the *Pembroke*, additional, for the *Dryad*, to date May 19th.

Legate, James, assistant engineer to the *Dido*, to date May 10th.

Lemon, J. A., fleet engineer, to be inspector of machinery in Her Majesty's fleet.

Leverett, H. T., artificer engineer to the *Medea*, to date May 10th.

Liversedge, Henry T., chief engineer to the *Pembroke*, for the *Speedy*, to date May 6th.

Main, Frank, engineer to the *Crescent*, to date June 8th.

Main, Frank, engineer to the *Victory*, additional, for the *Crescent*, to date April 28th.

Markham, R. G. L., assistant engineer to the *Illustrious*, to date May 10th.

Meadus, William H., chief engineer to the *Pembroke*, for the *Andromache*, to date April 26th.

Michell, William H., fleet engineer to the *Vivid*, additional, for the *Conquest*, to date April 15th.

Morris, Thomas, fleet engineer to the *Camperdown*.

Moss, Frank S., engineer to the *Crescent*, to date June 8th.

Pendleton, F. R., assistant engineer to the *Hannibal*, to date May 10th.

Pleming, John W., chief engineer to the *Pembroke*, for the *Dryad*, undated.

Pleming, John W., chief engineer to the *Pembroke*, additional, for the *Sappho*.

Rawling, Sylvester, staff engineer to the *Victory*, additional, for the *Naiad*, to date April 15th.

Rayner, Alfred, fleet engineer to the *Pembroke*, additional, for service as Admiralty Engineer Overseer of machinery under construction in the Liverpool District.

Rees, J. S., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Richards, T. W., assistant engineer to the *Northampton*, to date May 10th.

Roxburgh, William H., artificer engineer to the *Medusa*, to date June 8th.

Sanders, John S., fleet engineer to the *Hannibal*, to date May 10th.

Sharp, A. W., artificer engineer to the *Rodney*, to date May 10th.

Sharp, William, fleet engineer to the *Vivid*, additional, for the *Ocean*, to date April 28th.

Sisley, George J., assistant engineer (temporary) to the *Pembroke*, additional, for testing lamps and for general duty in the Reserve, to date May 10th.

Steward, C. H., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Taylor, E. J., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's fleet.

Thomas, Josiah P., fleet engineer to the *Victory*, additional, for the *Achilles*, undated.

Turner, J. H., engineer to the *Osborne*, to date May 5th.

Vine, Edward R., fleet engineer to the *Tamar*, additional, as chief engineer at Hong-kong yard, to date April 25th.

Walker, H. J., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Watkins, Benjamin J., chief engineer to the *Tartar*, to date May 19th.

Watson, A. D., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Wooldridge, G. W., assistant engineer to the *Hannibal*, to date May 10th.

Worth, Frederick, staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.

Young, Edward W., artificer engineer to the *Tartar*, to date May 19th.

HOAR & BROWN'S HARDWOOD MARKET REPORT, MAY 20th, 1898.

Teak: *Logs.*—The deliveries this year up to the present time have been slightly heavier than during the first four months of 1897.

The stock appears ample for the present, and prices are firm. Some business has been doing in floating cargoes at full figures.

Planks.—Shippers' quotations are stronger, although we hear of little being done at the increased figures. There is a fair demand, but stocks are large and higher prices are difficult to obtain.

Mahogany.—A very fair business has been done in minimum qualities, and large wood keeps steady, but there is plenty of stock for the amount of business doing.

Honduras.—The auction sales have been large, and owners have managed to rid themselves of a considerable quantity of poor class wood. The larger logs continue to command full prices.

Nicaraguan.—This wood has greatly grown in favour of late because of the sound condition, square edges and low price.

Tobasco.—Panel logs fetch high figures, but for crooked logs and small sizes there is little sale.

Panama.—The demand for this has died out of late, unless for quite sound and straight wood.

African.—The shipments are curtailed and values are advancing.

Cuba.—Stocks are very small indeed, and prices considerably increased.

Cedar.—The demand is fairly good provided prices are kept low, but in Paraguay there is little or no business.

Sequoia.—Prices in retail have risen, the stocks are small, and values are likely to advance slightly.

Walnut Wood.—The sale for large logs continues good, but the inferior description and small sizes sell very slowly and at extremely low figures.

Good boards and planks hold their own regarding price, but lower grades are not going so well.

Whitewood.—There is sufficient stock of logs, and enquiry is slack, but for boards prices are firmer and likely to advance.

Jarrah.—The demand is good and prices firmer.

Kaurie Pine.—Sales are slow and values are about the same, there has not been much doing of late although stocks are large.

Greenheart.—There is a good supply; a fresh cargo has just arrived. Prices are a little easier.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

MATTERS in the engineering shops and shipyards of the Clyde, and other centres, continue to progress satisfactorily, and arrears are being steadily wiped off. The influx of shipbuilding orders is now, however, far from being so copious as it was for a considerable period after the resumption of work by the engineers, and this is, of course, not unnatural and not altogether to be deplored. There is an immense volume of work not only in hand but still to begin to.

Notwithstanding that many far-seeing firms laid in stock considerably ahead, the demand for steel plates and angles has proved so great that producers have now more orders than they can fulfil, in spite of working night and day. The prices of these materials have steadily advanced of late, and now the quotations are £5 17s. 6d. to £6 per ton for steel ship plates, and £5 15s. for angles, less 2½ per cent. f.o.b. Owing to this advance, and the prospect of its still going further, American makers have lately been endeavouring to get a footing on this side for ships' plates, and offers have been freely made of supplies delivered at British ports at something below the home producers' quotations.

Whether or not the Americans are meeting with any great success, it is beyond question that shipbuilders are experiencing considerable difficulty in obtaining prompt supplies, and that in consequence considerable numbers of shipyard workers are idle for want of these materials. Those shipbuilders who find themselves clearly short of supplies will require to cover at stiff prices.

In response to the demand made by the steel workers the Board of Conciliation and Arbitration for the manufactured steel trade have resolved to grant an advance on the basis of a price of £6 for ship plates, and the advance came into force on Monday the 16th ult. The advance is one of 5 per cent. to the steel mill men earning over 30s. per week, and of 2½ per cent. to the mill men earning 30s. and under. The members of the Boilermakers and Iron Shipbuilders' Society, having requested an advance of 5 per cent., or ½d. per hour, the Clyde Shipbuilding Employers' Association have offered 2½ per cent., or ¼d. per hour, a compromise which, it goes without saying, the men are adverse to accepting. It is expected that Mr. Knight, the general secretary of the men's society, will be requested to repeat the demand for a 5 per cent. advance. Hitherto, it is pointed out, there has been an understanding on both sides that changes on the standard rate of wages should be 5 per cent. either way.

In common with other shipbuilding trades on the Clyde, the members of the Amalgamated Society of Engineers have now sent in an application to the Federated Employers for an advance of wages. This application, which is virtually a request deferred from about the outset of the disastrous dispute of last year, is for an advance of ½d. per hour so far as the Glasgow workmen are concerned, and for a ¼d. per hour as regards the workmen in the Paisley, Port-Glasgow, and Greenock districts. Individual employers outside of the Federation are being specially pressed by the men. The Associated Ironmoulders' Society have been granted an advance of ½d. on the present rate of wages, which are now higher than they have ever been during the history of the trade.

Messrs. D. & W. Henderson, of Meadowside Yard, Partick, who have already built a number of steamers for the Nippon Yusen Kaisha, the most recent being the *Wakasa Maru*, have booked a contract for a duplicate of this vessel, but with an increased speed. The dimensions of the new vessel, which will be 6,000 tons gross, are to be 470 ft. by 49 ft. 6 in. by 33 ft. 6 in., and she is to have long poop, bridge, and topgallant forecastle, and her speed is to be 15 knots. The vessel, which is to be classed at Lloyd's 100 A1, three-decked rule, and to have a Board of Trade passenger certificate, is to be delivered about June, 1899.

Messrs. Donaldson, Aitken & Scott, of Water Row Yard Govan, whose productions are of the small light-draught class of vessels, have contracted to build five steam trawlers—two of 130 tons each for Grimsby owners, two of 180 tons each for Hull owners, and one of 180 tons for owners in Scotland.

Messrs. Fleming & Ferguson, Limited, Paisley, have received an order from the Lancashire and Yorkshire and London and North-Western Joint Railways for a powerful suction-dredger to be employed in carrying out projected improvements at Fleetwood Harbour. The new vessel will be 211 ft. in length, 38 ft. beam, and 16 ft. 3 in. deep, and is to be capable of raising 1,500 tons of material per hour from a depth of 40 ft.

Messrs. Murdoch & Murray, Port-Glasgow, have booked, since last month's Notes were written, a 400-ton steamer specially adapted for service on the Amazon—for which river they have now supplied quite a fleet of similar craft—also an order for a steel screw cargo steamer of 4,700 tons, which is much the largest vessel ever undertaken by the firm. This new steamer is for Messrs. Gow, Harrison & Co., Glasgow, and Messrs. Murdoch & Murray not being themselves engineers, the engines for the vessel, on the triple-expansion principle, will be supplied by Messrs. Hall-Brown, Buttery & Co., of Govan.

Messrs. Blackwood & Gordon, engineers and shipbuilders, Port-Glasgow, have received an order from the Clan Line Co., of Glasgow, to build and engine a steamer of 4,000 tons, which will be fitted with all the appliances for working cargo and vessel customary in the vessels of this well-known company's fleet trading in Eastern waters. Messrs. Blackwood & Gordon have now a good amount of work in hand, and their repairing shop has been very busily employed for some time mainly with the annual spring overhaul to Clyde passenger steamers.

Messrs. David J. Dunlop & Co., Inch Works, Port Glasgow, have contracted to build and engine a steel screw steamer capable of carrying 3,500 tons dead weight.

For the erection of an extensive foundry, ground, it is said, has been acquired contiguous to the James Watt Dock and abutting on the road between Greenock and Port Glasgow.

Messrs. Chambers Brothers, yacht and boat builders, Greenock, have contracted to build a first-class 30 ft. sailing yacht for Mr. Duncanson, Greenock, and have also on order at present six of their patent semi-collapsible lifeboats intended for a steamer presently being built by Messrs. Workman Clarke & Co., of Belfast.

Messrs. Carmichael, McLean & Co., Greenock, early in the month contracted with Dutch owners for the building of a handsome screw passenger steamer to ply between Hull and Rotterdam. The engines for this vessel will be supplied by a Glasgow firm of engineers. The firm have also since contracted to build a first-class screw steamer of about 1,500 tons gross for the Holland Steamship Co., of Aberdeen.

Admiral Thomson and officers of the Imperial German Squadron, which paid a visit to the Clyde on Friday the 13th ult. and four succeeding days, were, on Saturday, conveyed from their ships, lying off Greenock, up the river to Glasgow and there entertained by the Lord Provost, magistrates and Council of the city. The sail up the river on board the *Duchess of Rothesay*, one of the crack river passenger steamers, was made under the most favourable conditions as to weather, state of tide, &c., and the large party of distinguished visitors seemed greatly to enjoy this experience. All, or almost all of the German officers spoke English, and were able to converse freely with the members of the deputation sent by the Glasgow Corporation to accompany the party up the river. Many officers were also conversant with practical naval construction, and keen interest was evinced in the work proceeding in the various yards. They showed themselves already well informed regarding the river Clyde and its world-renowned industry, but several could be observed taking notes of what they now saw, and of further information which was placed at their disposal. At Clydebank a slight stoppage was made where a good view was obtained of the cruiser *Ariadne* launched about three weeks ago, as well as the various vessels on the stocks. A close view of all the yards higher up was obtained, and cheers were given here and there by the men who clustered on the ships in process of construction. At Fairfield, as it happened, a remarkably representative collection of the productions of this famed establishment was "on view." In the company's tidal dock were noteworthy examples, nearly finished, of vessels for all three sections of service; viz., naval, mercantile, and pleasure. These included the first-class cruiser *Argonaut*, of 11,000 tons; the second-class cruiser *Hermes*, of 5,600 tons; the mail and passenger steamship *Carisbrook Castle* of 7,500 tons for the Castle Packet Co.; a paddle steamer of considerable tonnage and speed for the Roumanian Government, and the magnificent steam yacht *Atmah*, of 1,550 tons, for Baron Edmond de Rothschild, launched a few days previously. On the stocks conspicuous objects were the 7,000-tonner for the Orient Steam Navigation Co., and the second-class cruiser *Highflyer*, sister ship to the *Hermes*.

The *Carisbrook Gastle* went her official trial-trip in the Firth of Clyde on the 19th ult., a large company of gentlemen being present on the invitation of the Fairfield Company. This magnificent vessel, launched in October last, is the largest, as well as the latest, of the Castle Packet fleet. She is 500 ft. long overall, and 480 ft. on the water line. Her extreme breath is 56 ft. and her moulded depth 35 ft. 6 ins. There is accommodation for about 250 first-class passengers amidships, 150 second-class aft and 220 third-class forward.

Throughout the dining saloons, state-rooms and apartments of all kinds, as indeed over the whole vessel, the electric light is installed, the generating plant for which consists of three independent sets of engines and dynamos. Electric-motors for driving ventilating fans and for other power purposes, also form a noteworthy feature throughout the vessel, and in the machinery compartments. The propelling machinery consists of four-crank quadruple-expansion engines, balanced on the Yarrow-Schlick Tweedy system and this with the other machinery has been designed with a view to obtaining the maximum economy of fuel combined with high speed. The boiler pressure is 205 lb. per square inch, and the boilers are of exceptional size—the weight of each being about 109 tons—the heaviest probably ever put into any vessel of this description.

The real speed trials of the *Carisbrook Castle* was made some days earlier than the 19th, everything having been found satisfactory, and a speed of 19 knots having been attained. Speaking at the luncheon which was served on board on the homeward run, Dr. Francis Elgar, of the Fairfield Co., said, they had made the ship as complete as possible and in dealing with the Castle Co. they found gentlemen who knew exactly what they wanted. He hoped the vessel would long be a medium of communication between the great colony of South Africa and this country.

In the annual financial report of the Castle Packet Co., issued a few days prior to the trial-trip of the *Carisbrook Castle* above noticed, it is said "That in order to maintain the efficiency of the company's services, and in view of the conditions which may be required under the new mail contract, the council of the company have recently contracted with the Fairfield Co. for the construction of two mail steamers of between 9,000 and 10,000 tons gross register, and of adequate speed. Both vessels will be fitted with twin-screws and will have unsurpassed accommodation for a large number of passengers of all classes." Further additions to the fleet, according to the same report, are in contemplation.

One other of the Fairfield productions above alluded to: the magnificent new twin-screw steamer yacht *Atmah*—which was launched on the 12th ult., for Baron Edmond de Rothschild of Paris, from the designs of Mr. G. L. Watson—is noteworthy—apart from her dimensions, which are 285 ft. by 34 ft. by 21 ft. 3 in., and her elaborate and lavish apartments—as being fitted with engines having some novel features, and as having provision on her upper deck for the fitting of several quick-firing guns. The two sets of engines are on the triple-expansion principle, each set having four cranks and four cylinders; one high, one intermediate, and two low pressure. For the working of the four cylinders there are only two slide valves—that for the high and intermediate cylinders being of the piston type, and that for the two low pressure of the flat type—arranged on a system devised by Mr. John Thom, of Glasgow, to work with two sets of ordinary link-motion valve gear. The saving effected in engine space and in duplication of working parts is thus considerable, and much interest is felt in the results of actual working with this type of engine as bearing upon its prospective adoption for large merchant steamers.

Reference was made in last month's Notes to the trials which had been made with the paddle-steamer *Meg Merrilees*, fitted with two of Haythorn's patent tubulous boilers, while at the same time it was stated that no figures were as yet available. Since the official trial the vessel has been engaged daily on the service between Glasgow and the Holy Loch, steaming altogether about 14 hours each day. Both the compounding of the engines by Messrs. A. & J. Inglis, of Pointhouse, and the installation of water-tube boilers by the Haythorn Tubulous Boiler Syndicate, are giving much satisfaction. The speed is, I am credibly informed, easily one knot better than before, and the coal consumption less than a half of what it previously was. While the engines are probably giving the major portion of this saving, the gain in speed is directly due to the great saving in weight effected through the adoption of the Haythorn boilers.

The shipbuilding yards on the Forth and its estuary—which are about to be augmented by the Dry Dock and Engineering Co., of Alloa, where previously for some years shipbuilding operations were actively carried on—are at present extremely well supplied with work. The Dockyard Co., at Grangemouth have at present seven vessels on hand of a fair average tonnage, the most recent order booked being for a steel-screw steamer for London owners to carry about 1,200 tons on a light draught and to steam at a good rate of speed.

Messrs. Ramage & Ferguson, of Leith, who, on the 10th, launched the *Cathay*—a steamer of 340 ft. keel, and 6,000 tons deadweight capacity for Swedish owners, being the largest steamer ever launched by this or any other firm on the Forth—have a well-stocked yard, and orders still to begin with. One of the latter consists of a steam yacht—of which class of vessel the firm made a speciality—of 400 tons measurement and 15 knots speed, for Thomas Pink, Esq., from designs by Mr. Dixon Kemp.

Messrs. Hawthorne & Co., Leith, during the month completed a set of triple-expansion engines, which, together with new steam boilers, has been fitted on board the steamer *Countess of Breadalbane*, which plies with passengers on the famed Loch Awe. Trial runs have now been made with the vessel as thus fitted, the results being most satisfactory. The journey from Loch Awe Hotel, at the head of the Loch, to Ford, at its foot, was made in one hour and forty-five minutes, the return journey being accomplished in the same time, which is equivalent to a speed of close upon 14 miles per hour. The power developed over a great part of the journey was about 235 I.H.P. The engines and boilers were made by Messrs. Hawthorn & Co., to the specification and under the supervision of Mr. Richard Young, the able superintendent engineer to the well-known London and Edinburgh Shipping Co.

Messrs. Gourlay Brothers & Co., of Dundee, have recently completed one of the most important repairing contracts which has been carried through by Dundee shipbuilders for a long time. For the past three and a half months they have been busily engaged making extensive alterations and improvements upon the Northern Lighthouse Commissioners' steamer *Pharos*, virtually making her a new steamer. The machinery has been thoroughly renewed, the old vertical engines having been removed, and replaced by a set of compound diagonal surface-condensing engines, while two new large single-ended boilers have been fitted, also entirely new paddle wheels. The hull improvements embrace a new topgallant forecastle, new teak deckhouses and flying bridge, and the thorough renovation of the officers' accommodation. The result of preliminary trials is that the new machinery has been found to work most satisfactorily. It may be of interest to state that this is the third *Pharos* owned by the Northern Lighthouse Commissioners, and she was built in Glasgow in 1874.

The Dock Street Engineering Works, Dundee, belonging to the sequestrated estate of Messrs. McFarlane, Machan & Co., engineers and boiler makers, have been sold to Mr. Colville, solicitor, Crieff, on behalf of clients, at the upset price of £4,500. The sale included the fixed and moveable machinery, comprising engines, boilers, shafting, gearing, steam and hydraulic cranes, engineering and boilermaking tools. The works are of recent erection, and are provided with ample appliances for carrying on an extensive business.

The Clyde Trustees, as custodians of the public funds, are apparently taking every care that the most is made of the new facilities they possess for the dry docking of vessels within the harbour of Glasgow. Both before and since the official opening of the new graving dock, No. 3, on the 27th ult., it has been requisitioned to the utmost for the docking of steamers requiring hull cleaning and other overhaul, and the smart and effective dealing with such vessels has reduced very considerably the heavy list of steamers awaiting their turn in the graving docks, a list which, prior to the utilization of the new dock, involved fully a month's work with only docks No. 1 and No. 2 available. As an example of the capabilities of the new dock, for wiping off arrears in docking vessels, it may be mentioned that recently as many as four steamers, each of considerable tonnage, were docked simultaneously, scraped and painted, and all floated out again at one time. The steamers were the *Clan Mackintosh*, 382 ft. long and 3,994 tons gross, the *Arranmore*, 264 ft. long and 1,964 tons, the *Spaniel*, 250 ft. long and 1,116 tons, and the *Grampus*, 212 ft. long and 698 tons, the whole representing a total length of 906 ft. and 7,754 tons. The vessels were arranged in the order named, from the head of the dock, the two last named having been placed abreast of each other on the side tiers of keel-blocks.

Of the graving dock, Mr. James Deas, the engineer-in-chief of the Clyde Navigation, has made the following official intimation: "Our No. 3 graving dock, which I believe to be the largest dock in the world, was officially and successfully opened on April 27th. Its leading features are great length, great strength, large capacity, good workmanship, perfect watertightness, and rapidity of emptying by two centrifugal pumps, the largest by 6 in. that have ever been made. These pumps can empty the dock in an hour and forty minutes. By the completion of the Princes Dock in September last, its water area of 35 acres, and fully two miles of quayage, specially designed and constructed for the largest class of vessels afloat, and the finishing of No. 3 graving dock, the scheme authorized by Parliament in 1890 is completed, and the largest type of battleship can now easily come to Glasgow, along a wide and well-defined channel, more than 30 ft. deep, to be dry-docked and repaired."

The establishment of the Aluminium Rolling Mill at Greenock, contiguous to the works there, engaged in the manufacture of carbons for the British Aluminium Co., Limited, whose chief works are at the Fall of Foyers, Inverness-shire, will soon be *un fait accompli*. As already stated in previous notes, arrangements have been completed not only for a site for the works but with the Greenock Water Trust for a supply of water for driving purposes. Under the title of Scottish Aluminium, Limited, a company has been formed with a capital of £50,000 in £1 shares, and shares are now being subscribed for establishing and carrying on the new works at Greenock. Here the metal produced by the British Aluminium Co., Limited, at Foyers, on Loch Ness, or elsewhere, can be manufactured into plates, sheets, bars, tubes, wire, and other articles of commerce, or run into castings, or otherwise dealt with. The supply of the manufactured metal in the United Kingdom is exclusively in the hands of the British Aluminium Co., who prepare it for the market in their works at Milton, in Staffordshire. They are at present unable to cope with the growing requirements of the trade, and a working arrangement has accordingly been concluded whereby this company has secured an absolute monopoly of the sale and manufacture in Scotland of the aluminium produced by the British Aluminium Co., and by which, in addition to granting the monopoly for Scotland, that company binds itself not to supply ingots to any customer outside Scotland on more favourable terms than to this company, the consideration to be paid to the British company for the monopoly is 10,000 shares, issued as fully paid, and not transferable without the consent of the directors of the Scottish Aluminium, Limited.

For the visit to Sheffield of the Institute of Engineers and Shipbuilders in Scotland on 15th inst. and two following days, a preliminary programme of proceedings has been issued, from which it is at once apparent that the reception to be given to the members of this important institution, which includes so many of the "Captains of Industry," of Clydeside and the West of Scotland, is to be cordial in the extreme, and the entertainment and instruction of the best. The Scottish visitors will arrive in Sheffield late on Tuesday afternoon the 14th, and on the morning of Wednesday they will meet in the Cutlers' Hall for the reading and discussion of papers, following upon which they will be entertained to luncheon by the local reception committee, which consists of influential manufacturers and members of the municipality of Sheffield. For the afternoon, visits have been organised to alternatively—the Cyclops Works of Messrs. Charles Cammell & Co., Limited, and the Atlas Works of Messrs. John Brown & Co., Limited, both eminently representative of the heavy industries of Sheffield. A third alternative visit will be one to the electro-plating works of Messrs. Walker & Hall. In the evening the Institute dinner will be held in the Cutlers' Hall. On Thursday forenoon visitors will have choice of four perplexingly strong objective points of interests in (1) the Norfolk Works of Messrs. Thomas Firth & Sons; (2) the River Don Works of Messrs. Vickers, Son, & Maxim; (3) the Cutlery Works of Messrs. Rodgers & Sons, and the electro-plating works of Messrs. Mappin & Webb; (4) the Clyde Steel and Iron Works of Messrs. S. Osborn & Co., and the Dannemora Steel Works of Messrs. Seebohm & Dieckstahl. In the afternoon an excursion will be made to Welbeck Abbey, and in the evening the visitors will be entertained at a Conversazione in the Town Hall given by the Lord Mayor of Sheffield and Lady Mayoress. On Friday there is to be a whole day excursion to Haddon Hall and Chatsworth, dinner being provided at the Baslon Hydropathic Establishment.

THE TYNE.

(From our own Correspondent.)

Shipbuilding.—The sudden rise in freights that has taken place during the present month has, as might naturally be expected, reacted on the shipbuilding trade, and orders are now being pretty freely placed, at advanced prices, and on terms, as regards delivery of the shipbuilders' own choosing. Buyers would, of course, stipulate for delivery in three months' time, could they find any builders having the will or the ability to accommodate them. That, being quite out of the question however, they do the next best thing to ordering for early delivery at current rates, by purchasing from their owners, vessels in course of building, at greatly advanced prices.

It is well known that several enterprising firms of shipowners have, during the past six months, ordered far beyond their own prospective requirements, with a view of selling, in the event of circumstances arising which would enable them to do so at a profit, or keeping them "lying by" should that turn out to be the wiser course. The state of matters that has now arisen, however, must have exceeded their most sanguine anticipations: for not only is there a strong demand for new (and old) steamers of the best class; but the supply is altogether inadequate. Fortune has favoured the speculators in this instance by creating a situation entirely to their advantage, and there is no doubt that their enterprise is being amply rewarded. Several boats that are in advanced stages of construction, though not yet launched, have changed hands lately, the prices paid in all cases being a long way in excess of the contract rates, and it is understood that most tempting offers are still being made to owners of steamers building for the transference of proprietary rights in the uncompleted vessels. It may be safely assumed that for every new ship thus being transferred, another will be ordered without delay, and a considerable prolongation of the present state, of briskness in shipbuilding, is therefore guaranteed.

The agitation for an advance of wages in the shipbuilding trade is, as we had anticipated, spreading, and in addition to the boilermakers, the shipwrights, and two different societies of labourers, have applied to have the wages' rates increased. The shipwrights, who have at present 38s. 6d. per week, have asked for an additional 1s. 6d., which, if granted, will give them two pounds per week, the highest rate attained since the Crimean war. The application has, it appears, been made on behalf of the Wear shipwrights only; but it will be strange indeed if the Tyne shipwrights do not insist upon being dealt with at least as liberally as their neighbours, and it may be taken for granted that whatever advance is given will be made to apply to all. In reference to the labourers, it may be stated, that though two sets of officials are working for them, not much is likely to come of the exertions being made on their behalf. During the past quarter of a century or more, their wages have gone up and down quite regularly with those of the boilermakers, and independent of any exertions which may be put forth by their two sets of union officials, on the present occasion, they will get an advance equal to that which may be given to the boilermakers, and no more. There are, it may be stated, a large number of non-union men among the labourers, and these will get the benefit of any change in wages rates that may take place, just the same as the men who pay contributions to the rival unions.

It has just transpired that a new company has been formed for the purpose of taking over the yard at Howden, belonging to Messrs. Edwards & Sons, and carrying on the business of shipbuilding. The leading spirit in this enterprise is Mr. F. Rowland Hodge, a gentleman who has been for many years connected with the firm of Messrs. C. S. Swan & Hunter, and who consequently must have acquired the experience requisite for the successful running of an establishment that has not been noted for full and continuous work. Several influential gentlemen have joined the originator of the scheme, and there is no doubt that if capital and energy, combined with practical and technical knowledge, can make success, it will be achieved in this instance. The yard was originally opened some twenty years ago, and is therefore, so far as design and general "laying out" are concerned, the most modern on the Tyne. Care was taken to leave abundant room for lengthening the berths to any desired extent, when the yard was "laid out," as certain developments in ship construction that have since taken place were then foreseen; and the result is that the new company will be able to put down boats up to 700 ft. in length, without encroaching in the least on the ground set apart for the stocking of material. At the time of the original opening an adequate equipment of machinery was put down, but this is now somewhat antiquated, and it is understood that new plant of the latest and most effective description will now be provided. Additional shops will also be erected, and other alterations made to bring the place thoroughly up to modern requirements.

The other new yard that is being got ready for opening on the Tyne (The Parsons' Steam Turbine Co.'s), is rapidly approaching the necessary state of completeness. and it is probable that by midsummer one or more boats may be put down.

At the Elswick yard of Messrs. Armstrong, Whitworth & Co., work is just now exceptionally brisk, and a large proportion of the operatives are required to work overtime nightly, unless when prevented by unfavourable weather. Although only a couple of weeks have elapsed since a Portuguese cruiser was launched from the yard, the vacated berth is already being prepared for the reception of another keel, which will be put down in the course of a few days. There are six other building berths in the yard, four of them being at present occupied with cruisers, while the remaining two have a battleship and torpedo destroyer on the stocks. The battleship, which is yet in an early stage of construction, is understood to be for the Japanese Government, and its dimensions are considerably larger than those of the *Yashima*, built for the same Government some time ago. The torpedo destroyer is ordered by the home Government, and is in a tolerably forward stage. In addition to the vessels on the stocks, there are several in the water being fitted out, and almost as many operatives are employed on the latter as are engaged in the construction of the ships on the stocks. The deliveries of material at the yard have for a long time past been exceptionally heavy, and are likely to continue so for months yet. The Company's Low Walker yard continues to be kept extremely busy, and the establishments of Messrs. Dobson and Messrs. Wigham Richardson, at the same place, are as full of work as could be wished. Among the most recent orders booked by Messrs. C. S. Swan & Hunter is one for a 10,000 boat, from Sir Christopher Furness, who, it is stated, has placed an order for a similar vessel with the Palmer Company. Both the yards at Hebburn—Messrs. Stephenson's, and Messrs. Hawthorn Leslie & Co.'s—continue to be briskly employed, and at the Tyne Shipbuilding Co.'s yard there is a lot of work in reserve, besides that which now fills the berths.

In the repair establishments business is fairly good, most of the graving docks being occupied, while the pontoons and slipways of the river are, without exception, being profitably utilised. The reputation of the Tyne for quick despatch in repair work was, years ago, well established; but during the present decade it has grown by leaps and bounds, as is shown by the fact that mail and passenger vessels of the largest class have been brought in increasing numbers to test the capacity of our repairers, and the result has been in every case completely satisfactory.

In the building of ships' boats business is still rather dull, although an improvement as compared with the state of matters in the early part of the year is discernible.

Engineering.—The officials of the Amalgamated Engineer Society, have actually had the temerity to put in a claim for an advance of 5 per cent. on piece prices, and 2s. per week on time rates, to come into effect at the end of June. Should the employers accede to this, they will exhibit wonderful magnanimity; seeing that they have lost so heavily, through the engineers' mad crusade last year, and that according to the usages of warfare—whether civil or military—they are entitled to an indemnity. The employers have not claimed anything, though they might well have done so, being the victors in a fight which they had done nothing to provoke; and for their kindly forbearance they are now being rewarded by having a claim made against them. This action on the part of the engineers is likely to end in their further humiliation; for it is on the cards that the masters will reply to the application with a very unequivocal negative, and in that case what is to be supposed that the engineers will do? They cannot make another strike, and if they could they would not; for the dangers of such a course, after last year's experience, are too patent. Were the executive to order the men "out" again, it is probable that not one-tenth of them would obey the summons. The executive know this, and are not likely to openly exhibit their impotency. In the almost certain contingency of a refusal, there will consequently be no course open to them but to quietly concur, unless they have the grace to apologise for claiming an advance under such very peculiar circumstances. Whatever the employers may be doing, the operatives in the northern engine shops are rapidly making up for the loss sustained by them during the strike; overtime at extra rates being the rule in every factory. It is no uncommon thing for men to have nine days wages to take in a week, and cases are heard of, where two weeks' wages are worked for, between Saturday and Saturday. It would, of course, be impossible to make two weeks' wages in one week, working by time payment only, were it not for the liberal allowances made for working overtime, and this proves that former agitations against overtime were quite uncalled for, as no employer would resort to so expensive a method of carrying on productive work excepting under pressure of necessity. All the leading marine works on the Tyne continue as busy as possible, and locomotive work are also well employed.

The demand for Carrick & Wardale's special pumps for steamships is just now very active, and the department devoted to their manufacture is busier than for many months past. At Messrs. Clark, Chapman & Co.'s works business is also very brisk, especially in the departments where steamers' auxiliary machinery is produced. In the electrical departments, orders are also plentiful. The Newburn steel works (Messrs. John

Spencer & Sons) continue in active operation, the plate mills being particularly brisk. The Blaydon Forge Co. are provided with numerous orders for ships' stern frames, rudders, and engine shafting, and the weekly output, for some time past, has been considerably above the average.

Messrs. George Angus & Co. have more than maintained their position this year, as foremost among manufacturers of engine packings, valves, leather and india-rubber goods for shipboard, &c., and it would be difficult to say whether their trade for home account, or for export, has become the more prominent. The parent works at Newcastle are now exceedingly busy, and equally good accounts are reported from the branch establishments at Liverpool, Cardiff, and London.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—We understand that Messrs. J. L. Thompson & Sons, of the North Sands yard, are making arrangements to have the whole of their machinery at the Manors Quay Repairing Works driven by electrically transmitted power. This important work is being carried out by the Sunderland Forge and Engineering Co., Limited, and we hope to be able to give further particulars respecting it in a future number. The fine steamer, *Masconomo*, is at present being fitted out at the Manors Quay Works, and at the shipyard there are five large vessels on the stocks.

The Sunderland Shipbuilding Co. are reported to have three large vessels to build for foreign owners, in addition to those now on the stocks, one of which is of exceptionally large size.

Messrs. Austin & Sons have put down a vessel in the place of one recently launched, making three in all on the stocks.

The new pumps, recently fitted in connection with the firm's graving dock, were supplied by Messrs. Tangye, Birmingham, and it is, therefore, not surprising to learn that they have given the greatest satisfaction in work.

The whole of the yards above bridge continue busy, and in connection with Sir James Laing's establishment it is reported that a vessel over 500 ft. long, and of superior equipment, is about to be put down. Some very important changes are about to be carried out at this yard, which is among the oldest, if not the very oldest, on the Wear; but which, it would appear, is not likely to be left very far behind in the race with younger competitors. The projected alterations will, it is stated, involve the removal of a large part of the machinery from its present position to a more suitable one, besides the putting down of a good many new machines. There is also a quay or jetty to be constructed, alongside which vessels may be moored for purposes of repairing or finishing. The yard has undergone many changes within the present decade; but it would appear that the alterations now contemplated will far exceed in importance anything that was done before.

A contract of more than ordinary interest has just been completed at the Bridge Dock, namely the lengthening by some 20 feet of the Wear Commissioners' steam barge *Concrete.* This vessel was originally built, and has since been utilised for depositing concrete in bags, to form the foundations of the new piers protecting the mouth of the river. On each trip to sea it carried two bags—one 46 ft. in length, and one 23 ft.—both of which were dropped in the desired positions, at the extremities of the unfinished piers. Through the alteration made in the vessel's construction, each of the two bags to be carried out and deposited, will now be 46 ft. long, and it is understood that this arrangement will materially assist in hastening the completion of the piers.

The Strand Shipbuilding Co. have just launched two hopper barges from one building berth, which, it is understood, will not remain long unoccupied

Engineering.—Messrs. George Clark, Limited, are at present engaged in fitting the engines in the Japanese steamer, recently launched from the yard of Sir James Laing, and there is an abundance of other work in hand.

At the Palmer's Hill Works, the oil ship *Tuscorora* is being fitted with her engines, and is probably the largest vessel that was ever so dealt with at these works.

Messrs. Wm. Allan & Co. have fitted the engines of the *May-flower*, a fine steamer built at Stockton for London owners, but which is said to have been purchased by a Glasgow firm since being engined.

The s.s. *Kelvindale* is now beside the works, receiving her engines. At the other marine engine works vessels are also being fitted with their machinery, and all of them continue to be extremely busy.

The smaller engine works are generally very busy and in most cases more work could be obtained, if it was possible to give delivery within the next three months. Foundries are well employed, and both ironworks and forges are fully supplied with contracts.

The Hartlepools.—The death of Mr. Thomas Mudd, of the Central Marine Works, which has just taken place after an illness of only a few days, has caused the profoundest regret not only at the Hartlepools, where his name was "familiar as a household word," but at all the engineering and shipbuilding centres of the North East coast. This is not the place to descant upon the virtues of the deceased; but we may, in passing, pay our tribute of regret, and it would be strange to refer to the Hartlepools at this moment without mentioning this lamentable event.

The shipbuilding yards continue to show great briskness, and in connection with Irvine's establishment some further structural changes of great importance are to be carried out. At the docks business is still somewhat dull.

Stockton.—At Messrs. Ropner's yard, all the berths are full, and other establishments on the south side of the river continue very busy. The engine works are also very active, and both boiler and bridge works are fully supplied with orders. In the iron and steel works, the pressure of business is quite exceptional.

Middlesboro'.—At this centre as well as elsewhere, shipbuilding is exceedingly brisk, and a corresponding condition of activity is to be noted at the engineering establishments. Foundries are very busy, and the same remark applies to bridge works, boiler works, and steel works.

Consett.—Throughout the various departments of the Consett Iron Works business continues active, and the weekly output of plates, angles, and beams for shipbuilding purposes is above the average of recent years.

THE MERSEY.

(From our own Correspondent.)

THE marine engineering and all the other allied branches of industry in this district continue in much the same satisfactory position as reported last month. Exceptional activity prevails throughout all departments of shipbuilding and marine work, which necessarily more or less directly affects machine-tool makers, both in the light and heavy departments, and the principal firms throughout Lancashire have a large quantity of work in hand for the requirements of shipbuilding and marine engineering establishments, whilst in the general run of tools they are excessively busy, most of them being so full of orders that they are unable to book any new work where delivery is required before the close of the present year. Stationary and locomotive engine builders are also very full of work, and the boiler-making trade is in a more active condition than it has been for a very considerable time past. This exceptional activity is of course improving the position of the workmen, which was anything but satisfactory, so far as the principal trade unions are concerned, for some time after the settlement of the recent dispute, but the effects of the prolonged struggle have, by no means yet altogether disappeared. The returns of the past month show a further decrease in the number of men on the books, which, however, is still in excess of the average The Amalgamated Society of Engineers has nearly 4 per cent. of the total membership on out-of-work support, and the Steam Engine Makers' Society 2 per cent.

In the Manchester district of the Amalgamated Society of Engineers the proportion of out-of-work members is considerably above the average for the society generally, whilst the United Machine Workers' Society continues in a very unsatisfactory position, especially in some of the Lancashire manufacturing centres, about 20 per cent. of the members in Oldham and Bolton being still on donation. The general returns of the society are, however, not so unfavourable as in the above centres, and show only about 6 per cent. of the total membership on out-of-work support. The reports from the different districts as to the state of trade are of a most satisfactory character, especially in the marine centres, where exceptional briskness prevails.

With regard to the work in hand at Messrr. Laird Brothers' shipbuilding yard there is nothing new to report. It may, however, be mentioned that early in the month the large steam yacht *Princess Alice*, built by the firm for his Serene Highness the Prince of Monaco, was taken for a trial trip in Liverpool Bay, the Prince and a small party of friends being on board. Although a strong wind and a rough sea were experienced, the vessel went through her trial in a very satisfactory manner. On a run of about four hours' duration a speed of 13 knots was recorded, and the machinery worked with smoothness. The yacht has been built mainly for scientific purposes, and a description of the vessel has already been given in these Notes.

Rather elaborate apparatus is sometimes put down on emigrant steamships for the destruction of vermin in clothes, &c., and disinfection, and the following particulars as the result of experiments made by a very competent authority will be of interest. The hot-air chamber, whether heated by gas or any other fuel, can, he remarks, only be condemned in the plainest possible terms. With dry hot air it is practically impossible to raise the temperature to the required point, in any bulky object, in a reasonable number of hours. It must also be borne in mind that unless the destruction is absolutely complete, both of insects and eggs, it is only a question of a few days before the articles are again swarming with vermin, and for this reason the hot-air process is worthless. A most simple and efficacious method is to boil the clothes for a short time in water. The steam rapidly penetrates into the interior of materials, which are bad conductors of heat, and the temperature of boiling water is easily obtained throughout. Boiling water also makes a total clearance of vermin, until a fresh brood is introduced from an outside source. In any case, it is to be hoped that the use of many so-called disinfecting chambers heated by gas and other fuels will be put an end to.

Mr. Wm. English, of Moss Side, Manchester, has patented a new arrangement by which a dry surface is ensured for deck seats during snowy or rainy weather. This invention consists in introducing, as a covering for the seat, an endless roll formed of narrow flat strips of wood, riveted to leather bands, and presenting an even surface of the usual width of a single seat, which is slipped loosely round the seat-board, and by means of sunk finger holes or rings placed at suitable intervals, this roll can be readily revolved, bringing any portion into position for a seat, as may be required. Thus in the event of a seat having been exposed to rain or dust, and rendered unfit for use, the person desiring to sit down has simply to draw the roll backwards and forwards, and a perfectly dry or clean portion sufficient for a seat is still in reserve, if found necessary. The dust or heavy moisture is taken off the roll by an indiarubber scraper underneath the seat. To keep the roll laterally in position upon the seat board, each end of the board is formed with a rim, and to prevent rain or snow getting behind or in front of the roll a wooden shield is secured to the front or back of the seat, or to both, if necessary.

Messrs. Holden & Brooke, Limited, of Manchester, have recently brought out an improved type of pulsating pump. The special feature of this pump, which has been named the "Sirius," is the steam valve, which is so hung and balanced that it responds quickly and accurately to the alternate discharge of the pump barrels, and thus materially increases the beats and quantity of delivery, size for size, over pumps of its class. The valve has large wearing surfaces, and both valve and seat, which are of brass, are exceptionally solid and strong. The valve and seat form a plug like that of an ordinary stop-cock, and can be readily taken out, repaired or renewed, at a trifling cost. The "Sirius" pump is made in various sizes, to deliver from 1,000 to 90,000 gallons per hour, and deals with any class of liquid, thick, sludgy, or hot, whilst it may be employed for various trades in almost any conceivable situation. Another novelty which the firm are introducing is the "A B" combination injector, which has been specially designed for use on portable and semi-portable boilers, small locomotives, &c., where it is of advantage to have as few extra fittings and joints in connection with the feed supply as possible. This new injector, which combines within itself the water cock, steam valve, check valve, and stop valve, is a compact instrument, and only one joint is needed on the boiler for attaching it, whilst there are no steam or feed pipes under pressure. The only outside pipes are those for the suction or overflow. The apparatus is strongly constructed throughout, and is fitted with the firm's restarting arrangement, so that should the working be accidentally interrupted from any cause, it will immediately restart without attention. In their general locomotive injectors the firm are busy on orders for the New Zealand and Finland Government lines, and for several of the leading Indian lines, whilst in injectors for stationary boilers they are also full of work.

The Gandy Belt Maufacturing Co. have recently taken over the European agency of the "Standard" wood separable pulleys, one of the chief features of which is a patent bushing system. All the pulleys of from 24 in. diameter upwards are made with a bore for a 3½ in. shaft, and all pulleys below 24 in. diameter are made for a 3 in. shaft, unless otherwise specified. Each pulley is furnished with a wood bushing to any size of shaft required, thus enabling users to make changes from one line of shafting to another of different size, and utilise pulleys on hand. One pulley can be made to fit twenty-two or more sizes of shafting, by simply inserting a bushing of the requisite size.

A new machine has been designed by Messrs. Cunliffe & Croom, of Manchester, for drilling the holes in the tires of railway carriage, wagon, and locomotive wheels, after the body has been fixed on. In this machine the wheel is supported on four runners, the brackets of which are adjustable to different lengths of axles. The apparatus for drilling is arranged to draw back after drilling one hole, while the wheel is revolved for the next operation, this being repeated until the work is completed. An automatic motion is provided for feeding down the drill, and also a quick hand motion to wind back the slide quickly. The machine not only drills the holes, but studs them, so that even in case of breakage the tire would not escape from the body of the wheel. It may be added that the firm have a number of special machines, both vertical and horizontal, in hand, including large orders for railway work. In fact the machine above described, which we had an opportunity of seeing was being made for a locomotive building firm abroad.

In the iron trade of this district the improved tone noticed last month has been fully maintained, and an increasing weight of business has been coming forward both in raw and manufactured material, with a strong upward move in prices. For pig-iron the demand generally is more than makers are in a position to entertain, and on most brands they have put up their quotations 6d. to 1s. per ton. Local makers are now asking 46s. 6d. for forge to 49s. 6d. for foundry, less 2½ per cent., whilst Lincolnshire makers' quotations are 43s. 6d. to 44s. for forge, and 46s. to 46s. 6d. for foundry, net cash delivered. Manchester-Derbyshire foundry is not quoted under 50s. to 51s. net, delivered here. Outside brands have also stiffened up, and good foundry Middlesborough now averages 49s. 4d. to 49s. 10d. net by rail to Manchester, and 48s. 6d. at the Manchester Docks, whilst Scotch iron is quoted 50s. to 50s. 6d. for Glengarnock, and 50s. 6d. to 50s. 9d. for Eglinton, with American pig-iron about 50s. to 51s. at the docks for best brands, and ordinary qualities obtainable at Liverpool Docks at 47s. 6d.

In the finished iron trade the position has shown a steady improvement. For bars there has been a brisk enquiry, and advanced rates are now being quoted, £5 15s. having been fixed as the minimum for Lancashire qualities, with 2s. 6d. more quoted in some cases, whilst North Staffordshire bars are firm at £6 to £6 2s. 6d. Sheets are moving away rather more freely, and better prices are being got, with £7 about the average figure. A fair demand is reported for hoops at the Association list rates of £6 10s. for random to £6 15s. for special cut lengths delivered Manchester district, and 2s. 6d. less for shipment.

Exceptional briskness prevailed in all departments of the steel trade, and prices maintain a strong hardening tendency. Hematites are about 1s. dearer, good foundry qualities being quoted 59s. 6d. to 62s., less 2½ per cent., delivered here. For local billets quotations are for the present withdrawn; bars range from £6 2s. 6d. and £6 5s. up to £6 10s., with boiler plates averaging £6 12s. 6d. to £6 15s. delivered in this district.

In the metal market makers continue very busy on orders for all descriptions of the manufactured goods for engineers, boilermakers, and locomotive builders' requirements. There is no alteration in list rates, but these are firm at the advanced basis reported last month. Delivered Manchester district, prices are as under:—Brazed brass tubes, 8¼d.; common rolled brass, 6¼d.; common brass wire, 6½d.; and copper wire, 7½d. per lb.

The import of timber has been moderate, and more activity has been shown owing to the rapid advance in ocean freights partly on account of the war between America and Spain. Values generally have advanced, and stocks, which, under ordinary conditions would be considered large, are now being more firmly held. The stock of East India teak is too heavy, but prices are firm. Only one cargo of Greenheart has arrived, and there has been a fair consumption, but the stock is ample.

In the coal trade a fair business comes forward generally, and pits are kept on practically full time, with a steady tone as regards prices. House coals are in moderate, though diminishing request, and prices on current sales are steady at about 10s. to 10s. 6d. per Best Wigan Arley; 8s. 6d. to 9s. for Pemberton four ft. and Seconds Arley, and 7s. for Common Household, whilst as regards forward contracts with dealers it is more than likely that they will not be taken by colliery owners at such low rates as last year. Common round coals are meeting with a fairly active demand for steam and forge purposes, and are firm at 6s. 6d. to 7s. at the pit for inland sales, with colliery proprietors holding out for advanced prices on forward contracts. The same remark applies to the gas coal and locomotives' fuel contracts, which are now coming forward, the general advance talked of ranging from 6d. to 1s. on last season's prices. Engine fuel is rather more plentiful in some of the commoner sorts, and lower prices are here and there taken for prompt clearance of surplus lots, but generally recent quoted rates are maintained, the best qualities averaging 4s. 6d. to 4s. 9d.; medium, 3s. 9d. to 4s. 3d., and common sorts 3s. 3d. to 3s. 6d. per ton at the pit mouth.

In the shipping trade the exceptional pressure for supplies brought about by the commencement of the South Wales dispute has to a large extent fallen off, but there is still a good business doing. Prices have during the month gradually receded, and are now scarcely ruling much above old rates, good ordinary steam coal delivered Mersey ports, averaging about 8s. 9d. to 9s. 3d. per ton.

BELFAST.

(*From our own Correspondent.*)

SO far as the shipbuilding and engineering industries in Belfast are concerned, nothing of exceptional importance has taken place during the past month, although trade continues very brisk, night shifts still being employed on both the large engine shops on the Queen's Island, and this state of affairs will in all likelihood be maintained for some time to come. We are also glad to say that up to the present nothing has occurred to mar the good feeling existing between employers and workmen, everything seems to move along peacefully and speedily, and as yet the wages question has not been raised on this side of the Channel.

On 7th inst., Messrs. Harland & Wolff, Limited, launched, another very large twin screw steamer, named the *Slatendam*, which has been built to the order of the Holland-American Line and is intended to run between Rotterdam and New York. Her gross tonnage is about 10,400 tons, and besides being a large cargo carrier.

The s.s. *Dominion*, of the Dominion Line, left this port on May 5th, in order to take her station on the Montreal Line, after having undergone a very extensive overhaul, and had some alterations carried out by Messrs. Harland & Wolff, Limited.

This firm have also at the present time the s.s. *British Crown*, now renamed the *Mackinaw*, in one of the dry docks undergoing various alterations both to hull and machinery, which will materially alter her appearance, and suit her for another trade for which her new owners intend her.

The s.s. *Urmiston Grange*, owned by Messrs. Houlder Bros., has also left this port during the month, after having been thoroughly overhauled by her builders, Messrs. Workman, Clark & Co., who also have her sister ship, the s.s. *Denton Grange*, in dock at present for the same purpose. This latter ship will be leaving in a few days to take up her usual run in this well-known line.

The s.s. *Mourne*, owned by the Irish Shipowners' Co., Limited is also in dock at present in order to be overhauled and repaired by this same firm (Messrs. W. C. & Co., Ltd.)

It will thus be seen that with all these repairs and new work in hand, the docks are in a busy state just now—in all there are nine large steamships afloat or in dry dock awaiting machinery and repairs, the smallest of these is over 4,000 tons, whilst the largest is almost 12,000, and it is time something was being done in the way of providing larger accommodation for these very large vessels, else the trade of the port may suffer.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—The shipbuilding industry in this district remains very actively employed, and every department is in full swing, and many branches are working overtime. No new orders are reported during the month, indeed builders are not in a position to undertake much new work until they have cleared away much that is now on hand. The progress made with the *Amphitrite*, first-class cruiser, has been considerable during the month, and she is now sufficiently advanced to be ready for launching on July 5th. She is constructively in a much more forward position than vessels generally are when they are launched. She will, in fact, be launched with a deadweight of between 7,000 and 8,000 tons, the launching-ways at Barrow being able to carry great weights safely. Her engines are in a forward state, and will be ready for fixing in the ship so soon as she is launched. The experiments with Belleville boilers for the *Niobe* were so complete and exhaustive that no delay will arise in the case of the *Amphitrite*, whose 30 boilers are rapidly approaching completion. It is anticipated the *Amphitrite* will be ready to hand over to the Admiralty at a comparatively early date. The *Niobe* left Barrow for Devonport on her maiden voyage at the beginning of this month, and after a preliminary cruise in the Irish Sea proceeded in somewhat rough weather to her destination, where she is to be copper sheathed, receive her guns and other fittings, and then undertake her official trials. These will probably take two or three months, but there is reason to believe that she is so well finished that before the end of the year she will be in commission. The torpedo-boat destroyers *Bittern* and *Avon* are on the Clyde ready for their official trials, and the *Otter* and *Leopard* will soon follow them. Very marked progress has been made with the battleship *Vengeance*, which is evidently intended to be delivered to the Admiralty in almost a record time. She will be ready for launching before the *Amphitrite* is ready for sea, and possibly before the *Vengeance* leaves Barrow the belted cruiser *Hogue* will be launched. In the latter part of July the 7,000-ton telegraph construction steamer building at Barrow, to be named the *Anglia*, will be launched. She is a remarkably fine ship, and while embracing all the requirements and fittings for the laying of cables, she is so arranged that she can be used in the cargo-carrying trades. The steam yacht built at Barrow for Mr. Platt, of Newark, is now ready for her trials. Vickers, Sons & Maxim have commenced the work of building a large steam yacht for Sir William Wills, of Bristol, and work has also been commenced in the building of the Pacific Steam Navigation Co.'s 7,000-ton steamer, and also of the two British and African steamers, the orders for which were received in April. Altogether work in the shipbuilding department of the Barrow yard is very brisk, and it is likely to remain so, not only because builders have so much work already on hand, but because there is something more than a prospect of additional work in the early future in the form of commercial tonnage and various types of warships. It is in the latter department that the Barrow yard is likely to be most actively employed. Marine engineers and boilermakers are full of work, and night and day shifts are working. To an appreciable extent the backness of work caused by the engineers' strike has been overcome; engineers are, however, still greatly in arrears with their orders, and although much progress is being made in this direction, it must be remembered that the shipbuilding department is very busy and is furnishing more work than usual to the engineering branch. All the arrears in the engineering department will not probably be made good before Christmas. Considerable alterations and extensions are being made in the engineering department of the Barrow works, and the result will be an increased capacity of production.

Steel Shipbuilding Material.—A good market is maintained for steel shipbuilding material, and makers remain exceptionally busy in every department. Heavy steel rails are in good demand, and some good colonial orders have been booked, prices averaging £4 10s. per ton. In ship-plates the business doing is very considerable, and orders are offering to a greater extent than makers can deal with. Prices are firm at £5 18s. 9d. to £6 per ton for ordinary specifications, and boiler plates are at £7 per ton. Angles are at £5 15s. per ton. A very active market is maintained for heavy steel castings, and the foundries are working night and day. Several descriptions of steel are in very full request and the outlook of the trade altogether is satisfactory and bright.

The Hematite Trade.—A very full and steady business is being done in hematite qualities of pig-iron, and during the mouth prices have increased in consequence of the fuller demand and the increased cost of raw material. Makers are now quoting at 51s. 6d. to 52s. 6d. for mixed Bessemer Nos. net f.o.b., and warrant iron is selling at 51s. net cash buyers, 50s. 11½d. buyers. The order sheets at all works are very full, and makers generally are indisposed to sell large parcels for forward delivery. They would increase the make of their furnaces if they could get a fuller supply of iron ore from the native mines, but the output is restricted, and raisers take advantage of every rise in prices to get more money for their ore, and to enable them to do this they sell parcels only in comparatively small lots, so as to secure regularity in the revision of prices. Stocks have been further reduced during the month, and now stand at 171,652 tons, or 12,798 tons less than at the beginning of the year.

Shipping.—The shipping trade at west coast ports remains busy, and the exports of pig-iron and steel are expanding. The aggregate tonnage shipped this year has reached 186,401 tons of pig-iron, and 213,347 tons of steel, as compared with 162,690 tons of pig-iron, and 168,464 tons of steel in the corresponding period of last year, showing an increase of 23,711 tons of pig-iron and 44,883 tons of steel.

Miscellaneous.

"The Indicator Handbook."—Messrs. Emmott & Co., Ltd., have in preparation an entirely new work by C. N. Pickworth, Wh., Sc., entitled "The Indicator Handbook: a Practical Manual for Engineers." In Part I., which will shortly be issued, all the various modern instruments are very completely described, together with the best methods of applying and actuating the Indicator. The errors of the Indicator and its connections are fully dealt with, while the precautions necessary to secure accurate diagrams and the general use and care of the instrument are also treated on at considerable length.

Trial of the Hodgetts Safety Ship.—On May 19th., a trial trip was undertaken from Messrs. Forrestt & Sons' Yard at Wyvenhoe, in Essex, to the measured mile in the neighbourhood to demonstrate the advantages of the above patent. A launch of 60 ft. had been ordered by the well-known African explorer, Major Gibbons, for a new expedition on which he is about to start. This barge is built in sections, to permit of easy transport over land, and for the sake of lightness, aluminium was the material selected. She can be made to form three separate vessels, two being worked by steam, the other to be taken in tow by one of the former, or they can be united so as to form a launch of 60 ft. The "Hodgetts" type was selected by Major Gibbons, on account of the extreme stability it offers, and of the surprising delicacy in steering, which in an ordinary flat-bottomed boat cannot be attained. The portions used in the experiments formed a boat 26 ft. in length, by 6 ft. beam. She was furnished with a small engine of 3 H.P., and had twelve adults on board. On the measured mile she showed a speed of 6 knots, clearly proving the claim of this type of vessel to an increase in speed over the usual form. There was no oscillation, nor any approach to what is called "rolling," and the stability of the new form was demonstrated when all on board stood in a line on one side of the boat, the deviation from the horizontal position of the deck produced a reduction of the freeboard on that side of about three inches only. The construction of this vessel being such as to present to the water two concave surfaces, one on each side of the main keel (instead of the ordinary convex bilges) there is absolutely neither bow wave nor side wash, the water, thrown off at the bow and from the sides in the ordinary type of ship, being in the case of the form now in question carried aft in two streams converging abaft the run and forming a constant supply of unbroken water to the propeller (or twin screws) and the rudder. Hence, also the accuracy and delicacy of her answering the helm, and the utter avoidance of propeller racing. All these phenomena were noted and confirmed by the experts and other qualified judges who were present, among whom were Major Gibbons, Colonel Smyth, Commander Hodgetts, Mr. Johnson (of Forrestt & Sons'), Messrs. Newbery, Toller, and Colquhoun (representing the Hodgetts Safety Ship Co., Limited, 1, Gresham Street,) and others. Owing to the constant presence of the two parallel streams of water under the channels or arches on each side of the keel, the vessel is cushioned upon them, and prevented from being submerged to anything like the extent to which the ordinary type of hull is submerged. Consequently the draught is less and the free-board greater than in the ordinary type of vessel. The obvious result of this phenomenon is that the Hodgetts Safety Ship will, *cæteris paribus*, carry a greater weight either in guns, ballast, cargo, or stores, than any other ship of the same dimensions and calculated displacement, as well as being a great boon to passenger steamers, and those engaged in the cattle trade. To sum up the results of the experiments, it was satisfactorily proved that, as compared with ships of the ordinary type, the Hodgetts Safety Ship possesses: 1. Increased stability. 2. Increased speed. 3. Increase of carrying capacity. 4. Greater ease and delicacy in steering and handling. 5. Avoidance of bow-wave. 6. Avoidance of side-wash. 7. Reduction of draught. 8. Avoidance of propeller-racing.

The Naval Pocket Book for 1898. London: W. Thacker & Co. 1898.

A VERY handy and useful publication is the Naval Pocket Book, which in the first two issues made for itself a name, even in times of European peace. The Hispano-American War causes us to welcome its third appearance with unusual warmth. Yet our pleasure at receiving it is tempered with sorrow when we see the title-page. For we see an alteration. We are reminded that Mr. W. Laird Clowes was the founder of the work, and we see that already he has given place to a new hand. This is Mr. L. S. Carr Laughton, who appears to have carried out the original idea successfully enough. But we may still express the hope that Mr. Laird Clowes may soon be restored to health, and enabled to again supervise the bringing out of his bantling. The information in the body of the work is well up to date, carrying us down to 1st February, 1898. An addendum takes us even further, including, as it does, a note of the blowing up of the ill-fated *Maine*, at Havana. We have had a good deal of occasion to refer to the Pocket Book in connection with present complications abroad, and we can bear witness to the fact that the scope is wide, including certain old and small vessels not found in some other books dealing with this subject, but, nevertheless, highly interesting at this moment, and that the details regarding ships set out seem elaborate and accurate. It is very useful, for example, to see under the name of a certain Spanish ship something more than the usual "Four 7-8in. B. guns." The breechloaders might, for all that appears there, be Krupp's or Armstrong's, and really formidable weapons. But a good deal is explained when the qualification "Hontoria" is inserted between the calibre and the mode of loading. That information the Pocket Book adds, and so we know which of the vessels now engaged in making history have really formidable weapons. The same regard for detail is seen in other matters. The presence of military tops is noted. So is the electric manipulation of guns and, where known, the expansion used in the engine-room. We can cordially recommend this little book, therefore to all—even the "general reader"—who desire to take an intelligent interest in what is passing abroad. Nor must we forget that a classification letter is added to each vessel for the purpose of assisting the student of modern sea power to classify for himself the vessels of the various navies, and so arrive at a fair estimate of the comparative naval strengths of the great Maritime Powers.

The Glasgow and West of Scotland Technical College.—The "Lord Kelvin" Gold Medal for the best day student in the Mechanical Engineering Laboratory, has been won by Mr. George A. Inglis (son of Mr. John Inglis, the well-known shipbuilder), and Macquorn Rankine Gold Medal for the best evening student in the same laboratory has been won by Mr. William Walker. These medals were founded about nine months ago by Mr. Andrew Stewart, with the object of stimulating experimental work in connection with mechanical engineering, and it is evident that Mr Stewart's object is being most fully realised, as Professor Watkinson reports that "the competition for these medals has been very great, and both the quantity and the quality of the work done in the laboratory has been greatly enhanced in consequence." By deciding to have these medals named after the late Professor Rankine and Lord Kelvin, Mr. Stewart has established a very important means of reminding students of the great debt which engineers throughout the world will ever owe to the work done by Rankine and Kelvin.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—ENGLISH.

Ebro.—On April 23rd, Messrs. Cochrane & Cooper, Grovehill, Beverley, launched a steam trawler, 100 ft. by 21 ft., with 11 ft. 6 in. depth of hold, fitted with triple-expansion engines of 45 H.P., by Messrs. Amos & Smith, of Hull. The vessel, which was named the *Ebro*, is an addition to the fleet of steam trawlers owned by the Ocean Steam Fishing Co., Limited, Grimsby.

Duke of Cornwall.—On April 23rd Messrs. Vickers, Sons and Maxim, Limited, launched at Barrow a twin-screw steamer for the Fleetwood and Belfast mail service. The dimensions are;—315 ft. long, 57 ft. beam, 17 ft. 6 in. depth, moulded to the main deck, and 25 ft. 6 in. depth to the promenade deck. The vessel is built to the order of the Lancashire and Yorkshire and London and North Western Railway Companies, and was christened *Duke of Cornwall* by Lady Stalbridge.

Ashton.—On May 5th this vessel was successfully launched by Messrs. Joseph L. Thompson & Sons, Limited, of The North Sands Shipbuilding Yard, Sunderland, and is built to the order of Messrs. W. & E. S. Lamplough of London, and is the fourth vessel built by this firm for these owners. The vessel is built on improved awning deck rules, her principal dimensions being, length overall, 338 ft.; breadth, 44 ft. 6 in.: and depth moulded 22 ft. 2 in. The engines and boilers are constructed by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool.

Ormazan.—On Thursday, May 5th, there was launched from the Southwick yard of Messrs. Robert Thompson & Sons, a fine steel screw steamer, specially designed for cargo and the cattle trade, built to the order of Messrs. Henry Fernie & Sons, of Liverpool. Length between perpendiculars, 340 ft.; breadth, 45 ft., and depth moulded, 25 ft. 9 in., and will carry a large cargo on about 21 ft. draft, and is constructed with extra strength to obtain Lloyd's minimum freeboard for three-deck vessels. Cellular bottoms and peaks for water ballast, these being divided longitudinally for trimming purposes. Cargo-poop, bridge amidships with accommodation for captain, officers and engineers;the saloon being neatly fitted up in different shades of solid oak. Topgallant forecastle with large and spacious rooms for petty officers and crew. Five large hatches with six powerful steam winches, and double derricks to each hatchway, also a large 20 ton derrick fitted on deck for lifting heavy pieces of machinery. Steam steering gear being fitted in engine room, with control shafting in wheel-house and pilot bridge. The vessel is being in every respect fitted with the latest up-to-date arrangements for a first class cargo and cattle steamer. Triple-expansion engines, having cylinders 24 in., 39 in., and 64 in. by 42in. stroke, with extra large boilers of 180 lbs. pressure, supplied by Messrs. George Clark, Limited. During construction the ship and machinery have been personally superintended by Capt. King and Mr. Payne, of Liverpool. As the vessel left the ways she was gracefully christened *Ormazan* by the wife of James E. Thompson, Esq., J.P., of Thornhill Park, Sunderland.

Marie Suzanne.—On Thursday, May 5th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer, *Marie Suzanne*, which they have built to the order of Messrs. Rodocanachi, Sons & Co., of London. The vessel will take Lloyd's highest class, and her dimensions are:—Length, over all. 341 ft.; breadth, 48 ft. 6in.; and depth, 24 ft. The deck erections consist of a poop, bridge, and forecastle. A handsome saloon and cabins for officers, &c., are fitted up aft, the engineers' rooms are in the bridge, and the crew's accommodation forward, including a bathroom for seamen and firemen. The hull is built on the deep frame system, with a cellular double bottom, large hatchways, two steam winches, steam steering gear amidships, hand screw gear aft, two donkey boilers, patent direct steam windlass boats on beams overhead, shifting boards throughout, stockless anchors, two telescoping masts, with fore and aft rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. William Gray & Co., Limited, supply fine triple-expansion engines of 1,200 H.P., having cylinders 24 in., 38 in., and 64 in. diameter, with a 42 in. piston stroke, and two large steel boilers to work at 170 lb. pressure per square inch. The vessel has been built under the superintendence of Mr. William Birchby on behalf of the owners, and the ceremony of christening the steamer *Marie Suzanne* was gracefully performed by Mrs. Hodgson, wife of Captain Hodgson, who will take command of the steamer.

Kelvindale.—On May 5th Messrs. Short Brothers launched from their yard at Pallion. Sunderland, a handsomely-modelled steel screw steamer, built to the order of the Glasgow Steam Shipping Co., of the following dimensions:—length, 334 ft. breadth, 45 ft.; and depth, moulded, 26 ft. 9 in. and capable of carrying a large cargo on a comparatively shallow draught. The vessel has been built of steel, under special survey, to the highest class in Lloyd's Registry, for the spar-deck grade, with deep framing in lieu of web frames or beams in lower hold, and is constructed on the cellular double-bottom principle, divided into compartments for trimming. The holds are four in number, with a large hatchway to each, with six powerful steam winches for the rapid discharging of cargoes. The vessel is fitted with a short cargo poop, long bridge amidships, extending over engine and boiler spaces, on top of which, in houses, is fitted accommodation for captain, officers and engineers, &c., the saloon being handsomely fitted up in polished hardwood, and on top of which is fitted the chart-room and wheel house, and flying bridge. The crew are berthed in a commodious topgallant forecastle. On leaving the ways the vessel was named *Kelvindale*, the ceremony being performed by Mrs. O'Neal, wife of Captain O'Neal, who will command the vessel. Messrs. Wm. Allan & Co., Limited, of Sunderland, will fit the steamers with engines and boilers having a working pressure of 180 lbs. and fitted with Howden's forced draught and with all the latest improvements in marine engineering. The vessel and engines during construction have been superintended by Mr. George M'Farlane, of West George Street, Glasgow, on behalf of the owners.

Vestal.—On May 5th there was launched by Messrs. R. Stephenson & Co., Limited, at Hebburn on Tyne, a steel twin screw yacht, of the following dimensions:—Length between perpendiculars, 193 ft., breadth moulded, 28 ft. 2 in. and the depth moulded, 16 ft. The two sets of engines, which are of triple-expansion type, have cylinders of 14 in., 23 in. and 37 in., by 24 in. stroke, with two large single ended boilers, and are also being constructed by the builders. The vessel, built for the Corporation of the Trinity House, London, from the designs of Mr. Frank C. Goodall, Surveyor of Shipping to the Trinity House, is to serve the double duty of a yacht used for the inspection of the lighthouses around the coast by the Trinity Brethren, and also as a working boat to lift and place buoys and sinkers, &c. The vessel was christened *Vestal*.

Warrior and Ullswater.—On May 5th Earle's Shipbuilding and Engineering Co. launched at Hull, two fine fishing vessels, one being for the Anchor Steam Fishing Co., Limited, of Grimsby, and the other for the Grimsby Union Steam Fishing Co., Limited. The first ship was named the *Warrior* by Miss Rose Raynor, and the second the *Ullswater* by Miss D. H. Baines.

Don Carlos I.—On May 5th, Sir W. G. Armstrong, Whitworth & Co. launched from their Elswick shipyard, the Royal Portuguese cruiser *Don Carlos I.* Her dimensions are—Length, 360 ft. breadth, 47 ft. 3 in.; draught, mean, 17 ft. 6 in.; displacement, 4,100 tons. She is sheathed with wood and copper, and has a protective deck of 1¾ in. on the flat, and 4 in. on the slope. She has a coal capacity of 1,000 tons, and will carry 700 tons on her normal draught, which at the most economical speed will give a radius of action of 10,000 knots. Her speed will be 22 knots with forced draught, and 20 knots with natural draught.

Clan Macfarlane.—On Friday afternoon, May 6th, Messrs. William Doxford & Sons, Limited, successfully launched from their yard at Pallion the turret-deck steamer, *Clan Macfarlane*. This vessel has been built (as her name implies) to the order of the Clan Line Steamers, Limited, Glasgow (Messrs. Cayzer, Irvine & Co., managers), and, in addition to being the thirty-ninth of her class afloat, is the sixth of the type at present owned by this company. This latest addition to the Clan Line fleet is a duplicate of four sister vessels now at sea, her leading particulars being:—Length, 400 ft.; breadth, 50 ft.; depth, 30 ft. 6 in.; deadweight capacity, 7,000 tons. She is fitted with all latest improvements to meet the requirements of the owners. The machinery has been built by Messrs. Doxford, and consists of tri-compound engines with cylinders 27½ in., 45½ in., 75 in., and 54 in. stroke, and three boilers 14 ft. 8 in. diameter and

11 ft. 9 in. long, capable of maintaining a speed of 12 knots. A complete installation of electric light is to be fitted by the Sunderland Forge & Engineering Co., Limited. There are 11 powerful steam winches made by J. Wigham, windlass by Emerson, Walker & Thompson Bros., steam-steering gear by Bow, McLachlan, and donkey boiler by Sudron & Co. A large number of people witnessed the launch, and among the visitors were Sir C. W. Cayzer, M.P., and Lady Cayzer. The *Clan Macfarlane* has been constructed to British Corporation rules, and will receive their highest class. During building she has been superintended for the owners by John Lyall, Esq., assisted by Messrs. Jackson & Watt. The christening ceremony was gracefully performed by Lady Cayzer.

Laura.—On May 7th Messrs. Irvines' Shipbuilding & Dry Docks Co., Limited, launched a handsomely-modelled steel screw steamer of 4,785 tons deadweight carrying capacity on Lloyd's summer freeboard. This vessel has been built to the order of Messrs. Pyman The Steamship Building Co., Limited, West Hartlepool, and is built to Lloyd's highest class under special survey, and is of the following dimensions:—320 ft. by 46 ft. by 23 ft., having poop, extra long bridge, admirably adapted for the cattle trade, and topgallant forecastle for the housing of the crew; cellular double-bottom for water ballast, all fore and aft except under boilers, also water ballast in the after peak. Special regard has been paid for dealing with rapid loading and discharging of cargoes, for which extra large hatchways have been fitted with powerful winches of the company's own make, and double derricks to each hatch, together with all the latest improvements in the entire outfit of the vessel, including steam-steering gear, and the latest improved steam windlass, &c. The boats will be placed on a platform deck overhead. The engines are of the triple expansion type, and will be supplied by Messrs. T. Richardson & Sons, West Hartlepool. As the vessel left the ways the christening ceremony was gracefully performed by Miss Muriel Pyman, daughter of Alderman Pyman, West Hartlepool, who named the ship *Laura*. The hull and machinery have been built under the personal supervision of Mr. Cromar, the owner's superintendent.

Wladimir Sawin.—On Saturday afternoon, May 7th, Messrs. Craig, Taylor & Co., launched from their Thornaby Shipbuilding yard, Thornaby-on-Tees, a handsomely-modelled steel screw steamer of the following dimensions, viz.:—280 ft. by 41 ft. by 18 ft. 9 in. She is of the partial awning deck type, and is fitted with water ballast in cellular double-bottom fore and aft, and in peaks. The vessel is constructed to carry a deadweight of about 3,100 tons on a light draught of water, and is equipped with four steam winches, steam windlass, patent steam-steering gear, large donkey boiler, screw gear aft, telescopic masts, rigged as a fore and aft schooner, and all modern improvements. Her machinery is being constructed by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, Middlesbro', the cylinders being 20 in., 32½ in., 53 in. by 36 in. stroke, with two large boilers working at 160 lbs. pressure. The vessel has been built to the order of Det Dansk-Russiske Damp-Skibsselskab, Copenhagen (Martin Carl, Esq., manager), and under the superintendence of Captain Christopher Jensen. As the vessel left the ways, she was gracefully christened the *Wladimir Sawin* by Miss Vera Nielsen, daughter of the Danish Consul, West Hartlepool.

Wilster.—On Saturday, May 7th, Messrs. William Gray & Co., Limited, launched the fine steel screw steamer *Wilster* for Messrs. Grechmann Bros., of West Hartlepool. The vessel will take Lloyd's highest class, and her dimensions are:—Length, overall, 300 ft.; breadth, 42 ft.; and depth, 21 ft. 9 in. The deck erections consist of a poop, bridge and forecastle. A handsome saloon and cabins for officers, etc., are fitted up aft, the engineers' rooms are in houses on the bridge and the crew's accommodation forward. The hull is built on the deep frame system, with a cellular double-bottom, after-peak tank, four steam winches, steam steering-gear amidships, hand screw gear aft, large donkey boiler, steam windlass, boats on beams overhead, iron grain divisions, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. William Gray & Co., Limited, supply fine triple-expansion engines of 1,000 H.P., having cylinders 21½ in., 35 in., and 58 in. diameter, with a 39 in. piston stroke and two large steel boilers to work at 180 lbs. pressure per square inch. The vessel is being built under the superintendence of Captain Ben Murrell on behalf of the owners, and the ceremony of christening the steamer *Wilster* was gracefully performed by Miss Swales, of York.

Chicago.—On Saturday, May 7th, Messrs. Furness, Withy & Co., Limited, launched from their Middleton Shipyard, West Hartlepool, a large steel screw steamer 490 ft. long overall, with a deadweight carrying capacity of 8,500 tons, and a measurement capacity of about 12,000 tons. This vessel has been built to the order of Messrs. Thomas Wilson, Sons & Co., Limited, Hull, and is intended for their passenger, cattle and cargo trade. She is built throughout of Siemen's-Martin steel to Lloyd's 100 A1 class, although in many instances the scantlings far exceed the Society's requirements. She is built on the web-frame principle, with cellular double-bottom for water ballast, with all the latest appliances for filling and discharging the tanks. The whole of the main framing of the vessel is of strong sectional material, the topsides being as strong as any other portion. The hull is divided into nine compartments by means of eight watertight bulkheads fitted in accordance with Board of Trade requirements for ocean passenger steamers. She will have nine large cargo hatches, and ten powerful steam winches by Clarke, Chapman & Co., and double derricks for the quick manipulation of cargo. She has three complete steel decks and in addition a shade deck above with a bridge 130 ft. long on top of it. Arrangements have been made for carrying over 800 head of cattle under the shade and bridge decks. The vessel will be rigged as a four-masted fore-and-aft schooner. Accommodation for about 18 first-class passengers is to be fitted in a large deckhouse on the bridge deck, bathrooms lavatories, electric bells, awnings, &c., will be fitted complete to ensure the comfort of the passengers at sea. An installation of electric light will be fitted throughout the vessel on the double-wire system. A special feature of the installation is the use of armoured flexible-cable for the portable lights in the engine-room and on deck, which will afford reliable protection against damage should the wires become twisted or left to chafe against the hatch-coamings. The engines, which are being constructed by the Central Marine Engine Works, West Hartlepool, have been designed to suit the requirements of the heavy Atlantic trade. The diameter of the cylinders are 32 in., 54 in., 90 in., by 66 in. stroke on the three crank triple-expansion principle, with a pressure of 200 lbs. per square inch, the cylinder supports consisting of massive cast iron divided columns. The propeller is of the variable pitch type, the blades being of manganese bronze. Steam is supplied by two double and two single-ended boilers, the latter being in the centre and arranged back to back, either serving as an auxiliary in port. On leaving the ways the ceremony of christening her *Chicago* was gracefully performed by Miss Ethel Brown, daughter of Christopher Brown, Esq., J.P.

Ceres.—On May 7th Messrs. W. Dobson and Co., launched at Low Walker-on-Tyne, to the order of the Russian Steam Navigation and Trading Company of Odessa, a steel screw steamer of the following dimensions;—Length, 345 ft.; breadth, 46 ft.; depth, 25 ft. 9 in. She is built as a spar deck vessel, with poop, bridge, and topgallant forecastle. The engines constructed by Messrs. Wigham, Richardson and Co., are of the triple-expansion type, having cylinders 23 in., 37 in., and 60 in. diameter, and 42 in. stroke. The vessel was christened *Ceres*.

Eboe.—On Monday May 9th, Sir Raylton Dixon & Co., Limited, launched from their Cleveland Dockyards, Middlesbrough, the handsomely modelled mail and passenger steamer *Eboe* built for Messrs. Elder, Dempster & Co., of Liverpool, for their cargo trade, and is a sister vessel of the *Bruxellesville* lately built by Sir Raylton Dixon & Co., Limited, for the Woërmann Line, Hamburg. Her principal dimensions are:—Length, 364 ft.; beam, 44 ft.; depth, moulded, 26 ft. Accommodation will be provided in most spacious and handsomely fitted cabins for 100 first-class and 60 second-class passengers with large dining-room panelled in marble and inlaid woods in house on deck. The first-class smoking-room, second-class smoking-room and cabin entrances will be elaborately fitted and decorated, and the vessel will be lighted throughout with electric light. A powerful refrigerating machine with large cooling chambers will also be provided for the conveyance of fresh meat, provisions, &c. Triple-expansion engines will be fitted by Messrs. T. Richardson & Sons, Hartlepool, having cylinders 27 in., 43 in. 72 in. by 48 in., stroke, supplied with steam by three large double-ended boilers working at 180 lbs. pressure, which it is expected will give a speed of 13 knots an hour. On leaving the ways the vessel was gracefully named *Eboe* by Miss Mabel Dixon, of Gunnergate Hall.

Cheshire and Devonshire.—On May 9th Messrs. Cochrane & Cooper, Limited, launched from their Grovehill Shipyard, Beverley, two steam trawlers of the following dimensions:—97 ft. by 20 ft. 6in., 11 ft. depth of hold, built to the order of the North Lincolnshire Steam Fishing Company, Limited, Grimsby, and will be fitted with triple-expansion engines, 40 H.P., by Messrs. O. D. Holmes & Co., Hull. The vessels will be supplied with all the most modern appliances for deep-sea fishing. As the vessels left the ways they were named the *Cheshire* and *Devonshire* respectively by Mrs. Cooper, of Beverley.

Elna.—On Tuesday, May 10th, Sir Raylton Dixon & Co., Limited, launched from their Cleveland dockyards, Middlesbrough, a fine steel screw steamer, built to the order of Martin Carl, Esq., of Copenhagen. Her principal dimensions are:—250 ft. by 35 ft. 6 in., 19 ft. moulded. She is built to Lloyd's highest class single deck rule, having poop bridge and forecastle and a deadweight capacity of about 2,000 tons on a light draught of water. The upper deck is of steel and iron, bridge-deck, iron sheathed, with wooden cabins, and poop and forecastle decks of wood. She is also fitted with four watertight bulkheads, water-ballast in cellular bottom and after-peak, and a most complete arrangement for the loading and discharging of cargoes. The accommodation for the captain will be in poop, with officers, engineers, &c., in bridge, and crew in topgallant forecastle. Triple-expansion engines will be fitted by Messrs. George Clark, Limited, Sunderland, having cylinders 18 in., 29 in., 48 in. by 33 in. stroke, with one large boiler working at 160 lbs. pressure. The vessel has been constructed under the personal supervision of Captain Knudsay. On leaving the ways she was gracefully named *Elna* by Miss Caspar, of Middlesbrough.

Eastward Ho.—On May 10th Messrs. Cook, Welton and Gemmell launched at Hull, a steam trawler, to the order of Messrs. T. T. White and Co., Limited. The vessel is to be fitted with engines supplied by Messrs. Tindall & Co.

Shakespeare.—Lately Messrs. Cook, Welton and Gemmell, successfully launched from their yard at Hull, the fourth steam trawler built to the order of the National Steam Trawling Company, Limited. The name of this latest acquisition to the fleet is the *Shakespeare.* The dimensions of the vessel are:—Length, 110 ft.; breadth, 21 ft.; depth, 11 ft. 6 in. Her machinery has been built by Messrs. Tindall & Co., engineers, Hull.

Maria.—On May 10th a fine steel screw steamer was launched from the Castletown Shipyard of Messrs. J. Priestman & Co. The vessel has been built to the order of Mr. Jos de Poorter, of Rotterdam, and is of the following dimensions:—Length, 352 ft.; breadth, 48 ft.; depth, moulded, 29 ft. She is of the spar-deck type, with long bridge amidships, and will be classed 100 A1 at Lloyd's. Six steel bulkheads divide the vessel into water-tight compartments, and the double bottom will provide ample water ballast. Special attention has been devoted to the loading and discharging arrangements, there being five large hatchways, worked by powerful steam winches, derricks, and all the modern gear for the rapid working of cargoes. The steam steering is placed at the after end of the engine casing, with controlling rods to wheel-house on flying bridge. On the bridge deck there is a large house for the accommodation of the captain and officers, the engineers being berthed at the after end of the bridge, and the crew forward. The engines are by Messrs. Wm. Allan & Co., Limited, Scotia Engine Works, Sunderland, the cylinders being 25 in., 41 in., and 67 in. diameter, stroke 45 in. Two large boilers will be supplied by the same firm, having a working pressure of 160 lbs. per square inch. The vessel and her machinery are being constructed under the personal supervision of Mr. Geo. H. Strong, M.I.N.A., consulting engineer, Hull, and the launch of the vessel was successfully carried out, and she was gracefully christened *Maria* by Miss Maria de Poorter, daughter of the owner.

Advance.—On May 18th Messrs. T. Turnbull & Son launched at Whitby, the first of a small number of barges, to the order of a firm on the Thames. The barge is of steel, and is 125 ft. long, 25 ft. beam, 10 ft. 8 in. deep, and has a carrying capacity of about 400 tons. The vessel was christened the *Advance.*

Princess of Wales.—On May 21st Messrs. Laird Brothers launched at Birkenhead, a steel paddle-wheel steamer, which they have built to the order of the South-Eastern Railway Co., for their passenger traffic between Folkestone and Boulogne. The vessel, which has been specially designed to meet the requirements of the Channel passenger service, is 270 ft. long, and her engines are of large power to ensure a high speed. The vessel was named the *Princess of Wales*, the christening ceremony being performed by Miss Boxer, daughter of Commander Boxer, R.N., the company's marine superintendent.

Prince George.—On May 21st Earle's Shipbuilding and Engineering Co., launched at Hull, to the order of the Dominion Atlantic Railway Co., the new steamer *Prince George.* This vessel is 290 ft. long, 38 ft. broad, and 17 ft. 3 in. moulded depth, and is being fitted out as a first-class passenger steamer. The accommodation is very extensive, comprising saloons, state-rooms, and sleeping accommodation for 338 first-class and 44 second-class passengers, music saloon, smoke-rooms, ladies' rooms, &c., and is being fitted with all the latest improvements for the convenience and comfort of the passengers, including electric light, hot and cold water service, heating and ventilating apparatus, bath-rooms, &c. Arrangements have also been made for the carriage of mails, a strong room for this purpose having been fitted on deck. The engines, which are twin-screw, will be put in immediately, and are of the following dimensions:—Cylinders 26 in., 40 in. and 45 in., with 30-in. stroke, and are supplied with steam from four single-ended boilers, 15 ft. by 11 ft. 9 in., at a pressure of 180 lbs. per square inch. All the usual auxiliary machinery will be fitted, including steam windlass, winches, steam-steering gear, forced draught, ash ejector, fire pump, &c., and for the purpose of driving the same, without distressing the main boilers, a powerful donkey boiler is being fitted. Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, have superintended the construction of the vessel. She has been built to Lloyd's A1 shade deck coasting class, and to satisfy Board of Trade and United States requirements for passenger steamers.

Clara.—On Monday afternoon, May 23rd, Messrs. Richardson, Duck & Co. launched from their yard at Stockton, a steel-screw steamer of the following dimensions:—Length, overall, 320 ft.; breadth, extreme, 44 ft.; depth, moulded, 22 ft. 10½ in.; tonnage, gross, about, 2,450 tons. This vessel, which has been built to the order of Messrs. Burdick & Cook, of London, will class 100 A1 on Lloyd's register, and has been built under special survey. She is of the single deck type, with poop for captain and officers, bridge over engines and boilers, with engineers' berths in after end, and topgallant forecastle for crew. A cellular double-bottom throughout and after peak tank are fitted for water ballast, and equipment includes extra large multi-tubular donkey boiler, 8 steam winches, double derricks to hatches, steam steering gear, steam windlass, stockless anchors, and all modern improvements for facilitating loading and discharging. The engines, by Messrs. Blair & Co., Limited, have cylinders 22½ in. 37 in. and 61 in., by 42 in. stroke, steam being supplied by two single-ended boilers, having a working pressure of 160 lbs. On leaving the ways the vessel was named *Clara*, by Miss Allan, Wallington, Surrey.

Fernio.—On May 23rd Messrs. Cochrane & Cooper, Limited launched from their Grovehill shipyard, Beverley, a steam trawler of the following dimensions:—100 ft. by 21 ft. by 11 ft. 6in. depth of hold. The vessel, which is an addition to the fleet owned by the Ocean Steam Fishing Co., Limited, Grimsby, will be fitted with triple-expansion engines of 45 nominal power, by Messrs. Amos & Smith, Hull, and will be supplied with all the latest appliances for deep-sea fishing. As she left the ways the vessel was named the *Fernio*, by Mrs. Bulpit, of Grimsby. After the launch the company adjourned to the offices of the builders, where the usual toasts were proposed and responded to.

Bellerby.—On May 23rd, Messrs. Ropner and Son launched at Stockton-on-Tees, a steel screw steamer of the following dimensions, viz:—Length, p.p. 320 ft.; breadth extreme, 44 ft., depth moulded, 24 ft. 3 in. The steamer is of the three-deck rule, with patent trunk, full poop, bridge, and t.g.f. She will be fitted with triple-expansion engines by Messrs. Blair & Company, Limited, having cylinders of 23 in., 38 in., and 62 in. by 42-in. stroke, and two steel boilers, 15 ft. by 10 ft., 160 lbs. working pressure. The vessel built to the order of Messrs. R. Ropner & Co., West Hartlepool, was named *Bellerby.*

LAUNCHES—Scotch.

Greta.—On April 21st Messrs. Scott & Co. launched a Greenock, to the order of Mr. John Scott, Halkshill, a steam yacht of 383 tons y.m., and of the following dimensions:—Length, 160 ft.; breadth, 22 ft. 9 in.; and depth, moulded, 13 ft. 6 in. She will be supplied by the builders with triple-expansion engines. The yacht was named *Greta*.

Ariadne (**H.M.S.**).—On April 22nd the Clydebank Engineering and Shipbuilding Co. launched the first-class protected cruiser *Ariadne*, built to the order of the Admiralty. In most respects the new vessel resembles the *Diadem*, recently constructed at Fairfield, but she has greater engine power. Her dimensions are:—Length, overall, 462 ft. 5 in.; length, between perpendiculars, 435 ft.; breadth, extreme, 69 ft.; displacement, 11,000 tons. The hull is of Siemens-Martin steel, and the protective deck, extending fore and aft, is of a curved form, and ranges in thickness from 2½ in. to 4 in. It covers the whole of the machinery, boilers, and magazines. The coal capacity at normal draught is about 1,000 tons, but twice that amount can be carried should necessity arise. The propelling machinery will consist of two sets of triple-expansion engines, each set having four inverted cylinders working on four cranks. The high-pressure cylinder is 34 in. in diameter, the intermediate 55½ in. in diameter, and each of the low-pressure 64 in. diameter. All are adapted for a stroke of 4 ft. It is expected that a speed of over 20 knots will be attained under ordinary conditions.

Kwangse.—On April 25th Messrs. Scott & Co. launched at Greenock, a screw steamer for the China Steam Navigation Co., Liverpool. Dimensions:—Length, 275 ft.; breadth, 38 ft.; depth, 22½ ft.; and 2,100 tons gross. The builders will supply triple-expansion engines. The steamer was named *Kwangse*.

Lady Betty Balfour.—On May 3rd Messrs. J. M'Arthur & Co. launched at Paisley, a passenger steamer named *Lady Betty Balfour*. The steamer was launched with steam up, and proceeded immediately on trial. The engines were fitted by Messrs. Bow, M'Lachlan & Co., Paisley, and a speed of 12 miles was obtained. The *Lady Betty Balfour* has been specially designed and built to the order of the Shannon Development Co., Limited, Dublin. The trial trip was in every respect satisfactory. The owners were represented at launch and trial by Mr. M'Cormick, superintendent-engineer of the company, under whose inspection steamer and machinery have been constructed. This is the second steamer built for the Shannon Co., and will, with the other vessel, be employed on the Shannon and lakes.

Amethyst and **Beryl.**—On May 4th Messrs. Mackie & Thomson, Govan, launched two steam screw trawlers, of 172 tons each, for the Kingston Steam Trawling Co., Limited, Hull. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Limited, Kinning Park. The vessels were named *Amethyst* and *Beryl* by the Misses Leymann, of Hull.

Atmah.—On May 5th the Fairfield Shipbuilding and Engineering Co., Limited, launched at Govan the twin-screw yacht *Atmah*, which they have built for Baron Edmond Rothschild, of Paris. The dimensions of the vessel are:—Length, 285 ft.; breadth, moulded, 34 ft.; depth, moulded, 21 ft. 3 in.; tonnage, yacht measurement, 1,550 tons. The yacht has been built under special survey, and will class 100 A1 at Lloyd's, and 1 3-311 Bureau Veritas in the Yacht Register of both societies. The hull is of steel, with side bar keel and bilge keels, clipper stem, and elliptical stern, topgallant forecastle, and raised quarter-deck. The bottom of the vessel is of the semi-longitudinal character of construction, with an inner bottom fitted under the main coal bunkers, forming water-ballast tanks for a length of about 50 ft. There are seven watertight bulkheads throughout the ship. On the shade deck provision is made for carrying several quick-firing guns. The machinery consists of two sets of triple-expansion engines, and the engine-room will be fitted with all the most modern appliances. All the shafting is of forged steel and hollow throughout. Steam is to be supplied by two single-ended boilers, each having four furnaces, and arranged with one funnel. The yacht, which will be fitted out complete in an elaborate manner, with all the most recent improvements, will be rigged as a two-masted schooner, with a square sail on the foremast. The intention was that Baroness Rothschild should launch the vessel, but the Baroness was unavoidably detained in the south, and the ceremony was performed by Mrs. Edmund Sharer. There was a large attendance of the public, and the ship, after a pretty launch, entered the water amidst cheers.

Dongola.—On Thursday afternoon, May 5th, there was launched from the shipbuilding yard of Messrs. D. & W. Henderson & Co., Partick, a large steel screw cargo steamer which they have constructed to the order of Messrs. MacLay & McIntyre, Glasgow. This latest addition to the large fleet of vessels already owned by this firm is in length 375 ft.; breadth, 50 ft., with a depth of 28 ft. 8 in.; having a gross tonnage of about 4,400 tons, and will be classed in Lloyd's 100 A1., and has been fitted with all the latest improvements to ensure the rapid and safe working of the large cargo which she has been designed to carry, including seven powerful winches, and also large derricks fitted at the hatches. Steam steering gear by Messrs. Bow, MacLachlan & Co., Paisley, is fitted amidships; the saloon and officers' accommodation is on the fore-end of bridge deck, and a chart-room and wheel-house have been built above this with a bridge which will give every facility to the officers in the navigation of the vessel. A set of triple-expansion engines will be supplied and fitted by the builders, having cylinders 25 in., 41 in. and 67 in. diameter, by 4 ft. stroke. The vessel, which is a sister ship to the s.s. *Angola* completed last month by the builders for the same owners, was gracefully named *Dongola* as she left the ways by Miss Lilia Maclay.

Hilaria.—On May 5th the Dundee Shipbuilders' Co. launched a steam liner which they have built to the order of the Rushworth Steam Shipping Co., Grimsby. She is a sister ship to the *Honoria*, recently built for the same owners, and is 112 ft long, 21 ft. 6 in. broad, and 12 ft. deep. Her engines will be supplied by Messrs. Cooper & Greig. The vessel was christened *Hilaria* by Mrs. France, wife of one of the directors of the company.

Spartan Chief.—On May 6th Messrs. Robert Duncan & Co., Limited, Port-Glasgow, launched from their shipbuilding yard a single-deck screw-steamer for Mr. T. B. Scott, of Liverpool, which was named *Spartan Chief* by Mrs. Scott, wife of the owner. The dimensions are:—260 ft. by 37 ft. 2 in. by 20 ft. 6 in. moulded, and the vessel is designed to carry about 2,750 tons deadweight on Lloyd's freeboard. Triple-expansion engines will be supplied by Messrs. Dunsmuir & Jackson, Govan, having cylinders 19 in., 30½ in., and 50 in. diameter by 36 in. stroke. The vessel is specially adapted for the timber-carrying trade, having poop, bridge, and forecastle, with the accommodation for officers and engineers in steel deck houses built on top of the bridge. The vessel is furnished with patent steam windlass, combined hand and steam steering gear, and steam winches at the four cargo hatches, the latter being made exceptionally large for taking heavy lumber. The steamer has been built under Lloyd's special survey for their 100 A1 class, and after launching she was towed by the Clyde Shipping Co.'s tugs to the Prince's Dock, Glasgow, to receive her machinery.

Alert.—On May 7th Messrs. John Fullerton & Co., launched at Paisley, a steel screw steamer to the order of Messrs. Smith & Ritchie, Fish Market, Glasgow, for that firm's carrying trade from the West Coast fishing ground. Compound engines are to be supplied by Messrs. Fisher & Co., Paisley. The steamer was named *Alert* by Mrs. Smith, wife of the owner.

Olenda.—On May 7th there was launched from the shipbuilding yard of Messrs. Barclay, Curle & Co., Limited, Whiteinch, the screw steamer *Olenda*, built for the British and African Steam Navigation Co., Limited, to trade between Liverpool and West African ports. The vessel has been built under Lloyd's special survey, and will be classed 100 A1 under the three deck rule, having extra stiffening above rule requirements. The vessel is fitted with handsome and commodious accommodation for both first and second class passengers, special attention having been given to the ventilation so necessary in hot climates. Her dimensions are:—345 ft. by 42 ft. by 25 ft. 8 in., with a gross tonnage of about 3,220 tons. A sister ship to the *Olenda* is presently under construction in Messrs. Barclay, Curle & Co.'s yard, and both vessels and engines have been built under the superintendence of Messrs. Wilkie & Steel, assisted by Messrs. Campbell & White, the owners' surveyors. The naming ceremony was performed by Miss Davison, of Glasgow. After the launch the vessel was towed to the crane to be fitted with her machinery, which has been constructed by the builders. The engines are of the triple-expansion type, having cylinders 23 in., 38 in., and 62 in. by 3 ft. 9 in. stroke, steam being supplied from two large single-ended boilers at 180 lbs. pressure. She is fitted with all the latest improved auxiliary machinery, including electric light, steam cranes, winches, etc.

Rainbow.—On May 7th Messrs. D. & W. Henderson & Co. launched from their shipbuilding yard at Partick, a very handsome schooner-yacht of about 300 tons Thames measurement, which they have built for Mr. C. L. Orr Ewing, M.P., from the designs of Mr. G. L. Watson. This vessel is considerably larger than any of the sailing yachts which Mr. G. L. Watson has undertaken recently, and though she has been designed and fitted out as a comfortable cruiser, she will enter for the principal cruising races, and will doubtless show a very fine speed. She will be rigged as a two-masted schooner, and the large masts of Oregon pine which are to be fitted indicate that she will have a large spread of canvas. Internally the yacht has been fitted in a most comfortable and handsome manner. The saloon and principal state-rooms are the work of Messrs. Bertram, of London, who will carry out their portion of the work in a most tasteful and luxurious style. Captain Carter, so well known in yachting circles as the commander of H.R.H. the Prince of Wales' yacht, *Britannia*, has been appointed to the new vessel, and though, owing to ill-health, the yacht will be in charge of Captain Jay for a month or so, it is hoped that Captain Carter will be ready and well enough to take charge of her before long. The schooner-yacht is a vessel which of late years has not been much seen in the principal races, but the advent of this new vessel will perhaps bring the schooners back to the position they held before the steam yacht ousted them from their position as cruising vessels. On entering the water the vessel was gracefully named *Rainbow* by Miss Orr Ewing, daughter of the owner.

Cathay.—On Saturday, May 7th, Messrs. Ramage & Ferguson, Limited, launched from their shipbuilding yard at Leith, a very large and powerful steel screw steamer of about 6,000 tons deadweight capacity, built to the order of the East Asiatic Steamship Co., Limited, of Copenhagen, for their trade between the Baltic and continental ports, with Siam, in China, and the Far East. The new steamer which, on taking the water, was named the *Cathay*, has dimensions as follows:—Length, over all, about 380 ft.; length, between perpendiculars, 370 ft.; breadth, moulded, 46 ft. 6 in.; depth, moulded, 29 ft. Amidships a very long bridge is placed, having spacious first-class cabin accommodation above in large deckhouses, fitted up with all special requirements for comfort in the tropical regions to which this steamer will run. The crew are berthed in a top-gallant forecastle forward, and the ship's officers nearer the centre of the ship. Teak decks are laid wherever exposed to the weather, and all the latest cargo appliances have been supplied, as well as steam-steering gear, steam windlass, &c. Triple engines are supplied by the builders, having cylinders 25 in., 41 in., and 66 in. diameter by 45 in. stroke, supplied with steam from three very large steel boilers, working up to 160 lbs. pressure. The launch of such a large vessel in Leith, attracted a numerous assemblage of spectators, who cheered loudly on the vessel successfully taking the water. A large company were afterwards entertained by the builders to a cake and wine banquet, when the toasts usual on such occasions, were duly honoured.

The Empress.—On May 7th the Ailsa Shipbuilding Co., launched from their shipbuilding yard at Troon, a steel screw steamer, classed 100 A1 at Lloyd's, for Messrs. J. Hay & Sons, of Glasgow. The steamer is intended for the coasting and continental trade, and is of the following dimensions:—Length, overall, 184 ft.; breadth, 27 ft.; depth, moulded, 13 ft. 4½ in. Compound surface-condensing engines, with cylinders 21 in. and 44 in. diameter by 30 in. stroke, will be fitted by Messrs. Muir & Houston, Limited. The ceremony of naming the vessel *The Empress* was gracefully performed by Miss Jessie Stevenson, Romford, London.

Kathnia.—On May 9th Messrs. John Duthie, Sons & Co., launched at Aberdeen a steam trawler, built to the order of the Waterford Steamship Co., Waterford. The vessel is 110 ft. in length, 20 ft. 6 in. in width, and 12 ft. in depth, and will be fitted with triple-expansion engines. She was named the *Kathnia*.

J. Baels-Mauriex.—On May 9th Messrs. Hawthorns & Co., Limited, launched at Leith the screw-steam trawler *J. Baels-Mauriex*, built to the order of Belgian owners. This vessel will be fitted by her builders with powerful triple-expansion engines and all the latest improvements for a first-class vessel of her description.

Katherine.—On May 10th Messrs. John Fullerton & Co. launched at Merksworth, Paisley, a steel steamer of about 300 tons, which has been built to the order of Messrs. Sully & Co., Limited, Bridgewater, for their coal carrying trade in Bristol Channel, &c. Messrs. Ross & Duncan, Govan, will supply the vessel with compound engines of 400 I.H.P. The steamer was named the *Katherine* by Mdlle. Chaineux, of Brussels.

Isabel.—On May 18th there was launched from the shipbuilding yard of Messrs. Scott & Sons, at Bowling-on-the-Clyde, a steel screw steamer of the following dimensions, viz.: 100 ft. by 23 ft. by 11 ft. 4 in. moulded, which they have built to the order of Messrs. Joseph Monks & Co., Limited, Warrington. Compound surface-condensing engines will be fitted on board by Messrs. Ross & Duncan, Govan. On moving down the ways the vessel was named *Isabel* by Mrs. Monks, Warrington.

The Pansy.—Lately the Grangemouth Dockyard Co., launched from their shipbuilding yard at Grangemouth, a steel screw steamer, built to the order of Messrs. R. Hughes & Co., of Liverpool. The vessel has been designed to carry a deadweight of 700 tons on a light draught, and will be fitted with all modern appliances for the quick working of cargo, steam windlass, steam-steering gear, and is fitted with large water-ballast capacity. The machinery will be supplied by Messrs. Hutson & Son, Kelvinhaugh, Glasgow. As the vessel left the ways she was named *The Pansy* by Miss Tannahill, Glasgow.

Calista.—Lately Messrs. C. Connell & Co. have launched at Whiteinch, the steam yacht *Calista*. Her dimensions are:—130 ft. by 21 ft. 1½ in. by 12 ft. moulded depth, and of 258 tons Thames measurement. She is built of steel in excess of Lloyd's requirements. The engines supplied by Messrs. Hall-Brown, Buttery & Co., are of triple-expansion surface-condensing type, the cylinders being 11 in., 17 in., and 27 in. respectively, with a stroke of 20 in. The machinery has been constructed to the specification and under the superintendence of Messrs. G. S. Goodwin & Co., of Liverpool.

Herminius.—Lately Messrs. Russell & Co., Port-Glasgow, launched to the order of Messrs. Houston & Co., Liverpool, the spar-deck steel screw steamer *Herminius*, of 5,800 tons deadweight. The dimensions are:—Length, 340 ft.; breadth, 46 ft.; depth, 28 ft. 6 in. The machinery will be supplied by Messrs. Hutson & Son, Glasgow.

Crotan, Nero, and Plato.—Lately Messrs. Mackie & Thomson have launched at Govan three steam trawlers, uniform in design and dimensions—100 ft. by 20 ft. 6 in. by 11 ft. 7 in., and 160 tons, named the *Crotan*, *Nero*, and *Plato*, to the order of the Orient Steam Fishing Co., Grimsby.

Calanthe.—On May 19th, at Linthouse, Messrs. Alex. Stephen & Sons, launched a beautiful steam yacht for their senior, Mr. Alex. Stephen, of Kelly, and which was named the *Calanthe* by Mrs. Stephen. The *Calanthe's* length is 164 ft.; breadth, 24 ft.; depth, 13½ ft., and her Thames measurement 408 tons. She is fitted with triple-expansion engines having cylinders 13 in., 21 in., and 35 in. diameter by 24 in. stroke, with a working pressure of 200 lbs.

Unta.—On May 20th Messrs. Alex. Stephen & Sons launched a fine steel screw steamer of the dimensions:—410 ft. by 50 ft. 6 in. by 31 ft. 9 in., built for the British India Steam Navigation Co. She was named the *Unta* by Mrs. Clark, wife of Mr. J. Clark, the company's superintendent engineer. The engines are 26½ in., 42 in., and 66½ in. by 51 in. stroke. The vessel which is classed 100 A1 in Lloyd's with Board of Trade passenger certificate, and is fitted with all the British India Co.'s specialities, is a sister ship to the *Uganda* recently launched at Linthouse for the same owners, and which, after making a most successful trial trip fully loaded—attaining on runs between Cloch and Cumbrae Lights a knot more than the contract speed—is now on her maiden voyage to India.

Barge Loading Dredger.—On May 20th Messrs. Wm. Simons & Co., Limited, Renfrew, launched complete from their yard the first of four powerful barge loading dredgers which they have on order for the Russian Government. This vessel has been constructed under the inspection of, and is also classed by Bureau Veritas. It is of the following dimensions:—Length, 152 ft.; breadth, 32 ft. 6 ins.; depth, 12 ft.; and is designed to dredge to 33 ft. depth of water. The main gearing for driving the buckets and also the bucket chain is of the most powerful description for dredging hard ground, and is driven by compound surface engines of 500 I.H.P., fitted with two changes of speed for dredging hard and soft ground, and is connected at after-end to drive the propellers, independent steam hoisting gear is provided for manipulating the bucket ladder, and also independent steam winches are fitted at bow and stern of the vessel for manœuvring the vessel when at work. Electric light is fitted on deck and throughout the vessel for working day and night. There are separate cabins for the officers and crew, and private cabin on deck is also provided.

Lars Kruse.—On May 21st Messrs. Carmichael, Maclean & Co. launched at Greenock a handsomely-modelled steel single-deck screw steamer of the following dimensions: –264 ft. by 36 ft. 6 in. by 20 ft. 4 in. moulded; gross tonnage, 1,570 tons; and built to the highest class at Lloyd's, to the order of Messrs. Svendsen & Christensen for the Steamship Co. Cimbria, Limited, of Copenhagen. The vessel has been designed to carry a deadweight of 2,450 tons on light draught, with accommodation in forecastle, bridge, and poop, and will be fitted with all modern appliances for the quick working of cargo, steam windlass, steam-steering gear, and fitted with large water ballast capacity. The vessel has been built with a view to adaptability for general trade, and special arrangements have been made for the convenient carrying of deck cargo when on the Baltic route. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Limited, of Glasgow. The launching ceremony was performed, and the vessel named *Lars Kruse*, by Miss Kate Christiansen, daughter of Captain Christiansen, who represented the owners at the launch.

LAUNCH—IRISH.

Statendam.—On May 7th Messrs. Harland & Wolff launched at Belfast the large steel twin-screw steamer *Statendam*. The new vessel, the gross tonnage of which is about 10,400, has been built to the order of the Holland-American Line to run between Rotterdam and New York, and, besides being a very large cargo carrier, will have accommodation for a considerable number of passengers.

LAUNCH—GERMAN.

Energi.—On April 28th the Flensburg Shipbuilding Co. launched a steel screw steamer for Mr. H. C. Christensen, Marstal. She is intended for the Baltic trade, and has the following dimensions:—230 ft. by 34 ft. 10 in. by 15 ft. 10½ in. On leaving the ways she was christened *Energi*.

TRIAL TRIPS.

Minterne.—On April 25th the steamship *Minterne*, recently launched from the yard of Messrs. Short Brothers, Sunderland, for the Minterne Steamship Co., Limited, went out on her trial loaded, with very satisfactory results. The vessel is of the improved spar-decked type, having single deck laid with open main deck beams, and is of the following dimensions:—Length, 316 ft.; breadth, 42 ft. 1 in.; and depth, moulded, 26 ft. 9 in. The deck erections consist of cargo poop, long bridge amidships, on which is accommodation for captain and officers; saloon, mess-room, &c., and the topgallant forecastle is fitted up for the accommodation of the crew. The engines, which have been supplied by Messrs. John Dickinson & Son, Limited, have cylinders 23 in., 38 in., and 62 in. diameter, with a stroke of 42 in., steam being supplied by two large steel boilers at a working pressure of 160 lbs. After adjusting compasses a series of runs were made over the measured mile, and a mean speed of 10 knots was obtained, the engines running smoothly with no vibration.

Gambia.—On Wednesday, April 27th, the cargo steamer *Gambia*, which has been built by Sir Raylton Dixon & Co., Limited, Cleveland Dockyards, Middlesbrough, to the order of Messrs. Elder, Dempster & Co., Liverpool, proceeded out to sea for her official trials under the command of Captain B. P. Evans. Her principal dimensions are 320 ft. by 44 ft. by 26 ft., moulded, and has a deadweight carrying capacity of about 4,650 tons on a light draught of water. She is fitted as a first-class cargo steamer, with only a few spare rooms for passengers, but very complete discharging gear, &c. Triple-expansion engines have been fitted by Messrs. T. Richardson & Sons, Limited, of Hartlepool, having cylinders 23 in., 36 in., 59 in. by 42 in. stroke, with two large boilers working at 160 lbs. pressure. At the conclusion of her trials, which were most satisfactory, the vessel proceeded to South Wales to load.

Lokoja.—On April 28th this fine steel screw steamer, built to the order of Messrs. Elder, Dempster & Co., of Liverpool, by Messrs. C. S. Swan & Hunter, Limited, Wallsend, went out on her trial trip, and the trial runs were very satisfactory, a speed of over 12 knots average being obtained. The owners were represented by Captain Evans and Mr. Lees, these two gentlemen having superintended the construction of the ship and machinery. The principal dimensions of the steamer are:—Length, 340 ft.; breadth, 45 ft. 8 in.; and moulded depth, 28 ft. 9 in. There are two decks laid, full poop, long bridge house amidships, and full topgallant forecastle. Accommodation for the captain and officers, and engineers is provided on the top of the bridge deck. There is a cellular double bottom, also 6 steam winches, and all modern appliances for the rapid discharge of cargo. The engines are by the North-Eastern Marine Engineering Co., Limited, of Wallsend, having cylinders 24 in., 40 in., 63 in., with 42 in. stroke, and two large boilers with a working pressure of 170 lbs. The vessel is classed 100 A1 at Lloyd's, and built under special survey.

Meg Merrilees.—On April 28th the Caledonian Co.'s paddle-steamer *Meg Merrilees*, which has recently been fitted by the Haythorn Syndicate with tubulous boilers, went on a trial trip in the Firth of Clyde. In a way the trial was a notable one, as hitherto the Board of Trade, which guards the interests of the public in this direction as in many others, has doubted the possible development in certain vessels of the water-tube type of boiler. The *Meg Merrilees* is the first vessel of her class to be fitted with boilers of the type, and the trials were so satisfactory that the performances during the summer will be watched with very great interest. Originally the *Meg Merrilees* had haystack boilers with low pressure, but when overhauling became necessary Captain James Williamson recommended his directors to try the latest generator. The renovating of the ship and the compounding of the engines were entrusted to Messrs. A. & J. Inglis, of Pointhouse, whose success with paddle steamers has from the beginning been marked. The new boilers—as all Haythorn boilers at present are—were built by Messrs. Inglis & Co., Limited, Airdrie. The working pressure of the displaced boilers was 40 lbs.; with the Haythorn boilers it is 200 lbs. reduced to 130 at the engines by reducing valves. The new boilers are in closed stokeholds with forced draught. Naturally they occupy much less space than the older type, and economy in this respect means a lot in a vessel which during the season has often to carry her full complement. In the matter of lightness there is also a gain, as the vessel's draught is 7 in. less than it was. The compounding of the engines was accomplished by replacing a 42 in. cylinder by one of 24 in., and the circulating pumps were replaced by centrifugal pumps manufactured by Messrs. Drysdale & Co., Glasgow. In the trials the economy of the boiler was obvious, a speed of 14 knots being obtained with one-half the coal consumption necessary formerly to drive her 13 knots.

Cayo Largo.—Lately the steamer *Cayo Largo*, built and engined by Messrs. John Readhead & Sons, West Docks, South Shields, for the Cuban Steamship Co., Limited, London, has been to sea on her official trial trip. The vessel was run several times over the measured mile, and averaged a speed of 12 knots with 2,100 tons deadweight, the machinery working very smoothly and the trial giving every satisfaction to both builders and owners.

Ushaw.—Lately the new steel screw steamer *Ushaw*, built by Messrs. Short Brothers, at Sunderland, for the Durham Steamship Co., Limited, Newcastle-on-Tyne, went out on a loaded trial trip with very satisfactory results. After adjusting compasses the vessel was run over the measured mile, when a mean speed of over 11 knots was attained. The dimensions of the vessel are as follows:—Length, 314 ft.; breadth, 45·2 ft.; and depth, moulded, 23·0¼ ft. The engines, having cylinders 24 in., 40 in., and 66 in., with a stroke of 42 in., and two large boilers working at 160 lbs. pressure have been fitted by Messrs. William

Allan & Co., Limited, of Sunderland. After the trial the vessel proceeded to Alexandria under the command of Captain Needham.

Gloria.—On April 28th the screw trawler *Gloria*, built for the Wear Steam Fishing Co., Limited, by Messrs. J. T. Eltringham & Co., of South Shields, had her trial trip under circumstances of an unfavourable character so far as weather was concerned. Nevertheless the vessel proved herself a smart sea boat. The trawler is 96 ft. 2 ins. in length; 19 ft. 1 in. broad; and 10 ft. 8 in. deep. The engines, of the compound surface-condensing type, were built by Mr. T. Grey, of South Shields. The cylinders measure 16 in. and 34 in., with a 22 in. stroke, and are of 47 N.H.P. Her net tonnage is 23·26 tons and her gross 130 tons.

Carola.—On April 30th the new steam yacht *Carola*, built by Messrs. Scott & Co., Bowling, on their own account, to replace the old steamer of the same name,ran her trials. The dimensions of the yacht are 65 ft. by 13 ft. by 7 ft. The engines have been supplied by Messrs. Ross & Duncan, Glasgow, and are capable of working to 120 lbs. pressure. The trials were run in the Gareloch in a strong north-easterly wind, and the speed attained was 8½ knots, which was considered highly satisfactory.

Princess Alice.—On April 30th the large new steam yacht *Princess Alice*, built by Messrs. Laird Bros. for the Prince of Monaco, was taken for a trial trip in Liverpool Bay, the Prince and a small party of friends being on board. Notwithstanding the strong wind and rough sea which prevailed, her performance was of a highly satisfactory character, a speed of 13 knots being recorded on a run of about four hours' duration, and the machinery worked with smoothness.

Algorta.—On Monday, May 2nd, the steamship *Algorta* had her official trip in the bay off Hartlepool. She is a fine steel screw steamer, built by Messrs. Wm. Gray & Co., Limited, to the order of Senor Ramon de la Sota, of Bilbao. She takes Lloyd's highest class, and her dimensions are:—Length over-all, 285 ft.; breadth, 41 ft. 6 in.; depth, 20 ft. 2 in. The vessel is built on the web-frame system, with cellular double bottom for water ballast, and after-peak ballast tank, steam winches, donkey boiler, steam-steering gear amidships, screw gear aft, steam windlass, schooner rig, with patent folding masts, boats on beams overhead, and is generally equipped in a first-rate manner for a cargo steamer. The engines have been supplied by the Central Marine Engine Works of Wm. Gray & Co., and are of the triple-expansion type, having cylinders 21½ in., 34 in. and 57 in. diameter, with a piston stroke of 39 in. Steam is supplied by two steel boilers working at a pressure of 160 lbs. per square inch. The vessel has been built under the superintendence of Captain Ricardo de Goicoechea and, that gentleman, together with the engineer superintendent, Mr. Fernando Torres, Captain Murrell, from Wm. Gray & Co.'s yard, and Mr. Jas. Lindsay, from the engine works, were present at the trial ,the vessel being under the command of Captain Tose de Bastiguieta. An average speed of 11½ knots was maintained, the behaviour of the ship and her machinery being in every way satisfactory. The trial completed, the vessel at once proceeded for the Tyne, where she loads for Bordeaux.

Symra.—On May 3rd the steamship *Symra*, built by Messrs. Ropner & Son, of Stockton-on-Tees, for Bergen owners, made her official trial trip in the Tees Bay, which was very satisfactory, the vessel steaming about 11 knots. This steamer has been built with the builders' patent "Trunk," being the 11th vessel built under this patent; has full poop, bridge, topgallant forecastle, &c., and will carry a deadweight cargo of about 4,465 tons. She is fitted with triple-expansion engines by Messrs. Blair & Co., Limited, of Stockton-on-Tees, and after adjustment of compasses the steamer proceeded to the Tyne to take in her bunkers prior to leaving for Hamburg.

Goolistan.—On Wednesday, May 4th, the steamship *Goolistan*, built by Messrs. Wm. Gray & Co., Limited, for Messrs. Frank C. Strick & Co., Limited, of Swansea and London, had her official trial in Hartlepool Bay. She is a sister vessel to the *Koordistan*, of whose trial trip we gave an account in a recent issue. Her engines have been supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited, and the construction of the vessel and her machinery has, as in the former case, been under the superintendence of Mr. Archibald Walker, of London. The trial was a very satisfactory one ,the vessel on its conclusion at once proceeding to Maryport and Manchester, taking in cargo at each place for Bordeaux.

Lizzie.—On May 5th the Fleetwood Steam Fishing Co.'s new steam trawler *Lizzie*, constructed by Earle's Shipbuilding and Engineering Co , Limited, Hull, to Lloyd's highest class, was taken out to Withernsea, and had a successful trial trip, prior to being handed over to the owners, for whom Messrs. Moodys & Kelly, of Grimsby, are the representatives. The vessel, which has engines of 55 N.H.P., underwent the various tests in a most satisfactory manner, and on the measured mile attained an average speed of 10½ knots per hour, the machinery working in a manner highly creditable to the contractors.

E. M. Dalgas.—On May 7th this steamer, built by the Grangemouth Co. to the order of Messrs. Svendsen & Christensen, of Copenhagen, for the steamship company Gembria, Limited, also of Copenhagen, made her official trial trip in the Firth of Forth. A speed of 12¼ knots was attained on a four hours' run, the engines working throughout with perfect smoothness and without a hitch or stoppage, and to the complete satisfaction of the owners. The *E. M. Dalgas* is built of the latest single-deck type, with accommodation in forecastle, bridge, and poop, and carries a deadweight of 2,500 tons on 18 ft. draught, with a net tonnage of 900. She has been built with a view to adaptability for general trade, and special arrangements have been made for the convenient carriage of deck cargo when on the Baltic route. The dimensions of the vessel are 234 ft. by 36 ft. 6 in. by 20 ft. 4 in. moulded, and she has been built on fine lines, with a view to a good sea speed. Triple-expansion engines of the latest and most economical type have been supplied by Messrs. Hutson & Son, Glasgow.

Daimler.—On May 7th the new twin-screw motor launch *Daimler*, with a party on board, went down the Clyde on her trial trip. The *Daimler* has been built by Messrs. Paul Jones & Son, Greenock, to the designs of Messrs. J. & H. M. Paterson, Greenock. She is a handsome-looking boat of 58 ft. length, 9 ft. 8 in. broad, and 5 ft. 4 in. deep. Built of elm, teakwood, and pitch-pine, with elm and oak framing, she is schooner-rigged, and has most superior accommodation. The motors are placed amidships, about 8 ft. space being occupied, and oil sufficient to drive the boat 1,000 miles is also stored there. The motors are supplied by the owners, the Daimler Motor Co., Limited, and are nominally 10 H.P. each. They are practically the same as those fitted to motor cars. The most important advantages of the system over steam are economy of space and weight, and greater power development taking them weight for weight with steam. The launch had a satisfactory trial, and, notwithstanding the choppy nature of the water, had no difficulty in reaching 9 knots per hour. The *Daimler* will make the rounds of the regattas this summer.

Elbing.—On May 10th the new steel screw steamer *Elbing*, built by the Flensburg Shipbuilding Co., for the Deutsch Australische Dampfschiffs Gesellschaft in Hamburg, made her first trial. Her dimensions are:—420 ft., 49 ft. 8 in., and 32 ft. 3 in. triple-expansion engines of 2,860 H.P. Speed 13·3 knots.

Idaho.—On Wednesday, May 11th, the s.s *Idaho* which has been built for Messrs. Thos. Wilson, Sons & Co., Limited, of Hull, by Messrs. C. S. Swan & Hunter, Limited, Wallsend, went to sea for her trial trip. The dimensions of the vessel are:—Length, 460 ft.; breadth, 50 ft.; and depth, moulded, 34 ft., 11 in.; and she has been specially built for the owners well-known cattle and general cargo service between Hull and New York; accommodation being provided for a limited number of passengers. The passengers, officers, and engineers are accommodated on the top of the shelter-deck, the crew being berthed in the forecastle. The whole of the space under the shelter-deck is fitted up for the conveyance of a large number of cattle. The engines have been constructed by the Wallsend Slipway and Engineering Co., Limited, and are of the triple-expansion type, having cylinders 31 in., 52 in., and 91 in. diameter, with a stroke of 5 ft. On the trial everything worked satisfactorily, and a mean speed of 14¾ knots was obtained over several runs across the measured mile. The owners were represented by Mr. C. H. Wellesley Wilson, and their superintendent, Mr. J. F. Wilkins, Mr. J. Spear and Captain Mallet, who expressed themselves highly satisfied with the programme of the vessel. There were also present Mr. C. S. Swan and Mr. De Rusett on behalf of the shipbuilders, and Mr. W. Boyd and Mr. A. Lain on behalf of the engine builders.

Glencoe.—On May 17th the s.s. *Glencoe* built by Irvine's Shipbuilding and Dry Docks Co., Limited, West Hartlepool, to the order of Messrs. Livingstone, Conner & Co., of the same town, proceeded to sea on her trial trip. Her dimensions are as follows:—313 ft. by 44 ft. by 23 ft. ½ in., with poop, bridge, and topgallant forecastle, cellular double-bottom for water ballast, all fore and aft, and in after-peak. Special regard has been paid for dealing with rapid loading and discharging of cargoes, for which extra large hatchways have been fitted with the company's latest type of powerful winches and double derricks to each hatch, together with all the latest improvements in the entire outfit of the vessel. The boats are placed on a platform deck overhead, and form an awning for the protection of the crew in tropical climates. The engines, which have been built by Messrs. Blair & Co., Limited, Stockton-on-Tees, are of the triple-expansion type, with cylinders 22 in., 36½ in., 61 in., stroke 42 in., steam being supplied by two single-ended boilers working at a pressure of 160 lbs. per square inch. During the trial a mean speed of 12 knots was obtained, and Mr. Livingston and Capt. Conner, who represented the owners, expressed themselves as highly satisfied with the smooth working of the engines and general equipment of the vessel. The builders were represented by Major D. G. Irvine, managing director, and Mr. Purdon, works' manager, and the engine builders by Mr. Corking. Luncheon was provided for a large number of visitors, and the vessel afterwards proceeded on her maiden voyage.

Laureldene.—On May 17th the trial trip of the turret steamer *Laureldene*, built and engined by W. Doxford & Sons, Limited, of Sunderland, to the order of the Dene Steam Shipping Co., Limited, took place off the Tyne. The following are the principal dimensions of the vessel:—Length between perpendiculars, 340 ft.; breadth, 45 ft. 6 in.; depth, moulded, 27 ft. 3 in. The steamer, it is stated, will carry 5,600 tons deadweight on a draught of 21 ft. 8½ in. Triple-expansion engines, 300 H.P., have been fitted on board. After a run along the coast the *Laureldene* was taken to Blyth to load for Port Said.

Anselma de Larrinaga.—On May 18th the trial trip took lace of the *Anselma de Larrinaga*, built by Messrs. Russell & Co. at Port Glasgow to the order of Messrs. Larrinaga & Co., of Liverpool. Her dimensions are:—365 ft. by 47 ft. 1 in. and 23 ft. 5 in. loaded draught. The machinery, by Dunsmuir & Jackson, of Govan, consists of a set of triple-expansion engines, having cylinders 25 in., 42 in., and 70 in., by 48 in. stroke, having two large boilers working at a pressure of 200 lbs. per square inch. The vessel was tried on the measured mile, and a speed of about 11 knots attained.

Countess of Breadalbane.—On May 18th the steamer *Countess of Breadalbane* made a trial run on Loch Awe, after being fitted with new triple-expansion engines and new boilers by Messrs. Hawthorn & Co., Leith. On the invitation of Mr. Fraser, there was a large company on board. The trial trip was of the most successful description, the journey from Loch Awe to Ford and back being made in 1 hour and 45 minutes each way, or a speed of close upon 14 miles an hour. The new engines on a great part of the journey worked up to 235 I.H.P., which was considered most satisfactory. On the steamer's return to Loch Awe Mr. Fraser entertained the party to luncheon in the Loch Awe Hotel.

Frederick Knight.—Lately the new screw steamer *Frederick Knight*, built and engined by Messrs. John Readhead & Sons, South Shields, for Messrs. W. H. & C. T. Jones, Cardiff, has been taken on her trial trip off the Tyne, and had a series of successful runs, averaging a speed of 11½ knots. After the trial the vessel returned to the Tyne to load for Genoa, under the command of Captain Evans.

Mount Blanc.—On May 19th the *Mount Blanc*, one of the trawlers built by Messrs. Cumming & Ellis, Inverkeithing, for Messrs. Muirhead's Trawles, Limited, Granton, had a trial trip on the Forth. The dimensions of the vessel are 109 ft. by 31 ft. by 11 ft. 9 in., and she is fitted with triple-expansion engines, having cylinders 12¾ in., 20 in., and 32 in. by 24 in. stroke; working pressure, 160 lbs.

Presidente Sarmiento.—On May 20th the training ship *Presidente Sarmiento*, just completed by Messrs. Laird Brothers, for the Argentine Government, was taken out for her official speed trial in Liverpool Bay, and kept under weigh for six hours. The speed was tested by four runs between the Bar and North-West ships, and the result was a mean of over 13½ knots, or half a knot beyond the contract speed. The performance of the vessel and machinery was in every respect satisfactory to Captain Don Onofre Betbeder, the chief of the Argentine Naval Commission, who was on board with his officers

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

THE LOSS OF THE "MAINE."

To the Editor of THE MARINE ENGINEER.

SIR,—I was disappointed in not finding in your April number any reference to the loss of the *Maine*, or any suggestion as to the means employed to effect that dastardly deed.

The story told in the *Daily Mail*, of the 9th inst., seems hardly possible in the face of Marshal Blanco's statement, "on his honour," that there were no submarine mines in Havana harbour on the day of her loss.

Accepting this statement as true, it must be a matter of intense interest to understand how it was possible to destroy a splendid ship, well manned, and well commanded, anchored in fancied security in a friendly harbour, and guarded with military discipline.

French naval experts have discussed the matter, and their opinion is that without a submarine mine, previously fixed in position, the destruction of the ship could not have been accomplished.

A diver would require time to fix a portable explosive to an iron hull under water, if indeed, he could do it at all, for air bubbles would betray the presence of a working assassin, as well as a Whitehead torpedo.

I have heard the following account of how the vile deed was done:—

Some wealthy natives determined to destroy the ship and all on board, and hired a skilful diver to effect their purpose.

The *Maine* is said to have been moored in 36 ft. at low water, her inshore anchor lying within 400 yds. of the beach.

The miscreants are said to have proceeded in a carriage from Havana, with the diver and all his gear, to a disused fisherman's hut on the water's edge, opposite the ship.

The diver is supposed to have walked out to the *Maine's* inshore anchor chain, directing his course under water by a compass illuminated by a carefully-shielded electric light. He carried with him a case of nitro-glycerine and two lengths of india-rubber pipes, for the supply of air from the air pump, and for the exhaust back to the shore.

By these precautions no air bubbles could betray his presence under water.

It is supposed that advantage was taken at a time when the *Maine* had swung over her inshore anchor chain.

The diver could easily climb up the chain, and fix his case of nitro-glycerine to the ship's chain where it was in contact with the port bow.

He would then have only to return as he came, and fire the charge by electricity from the hut.

The Spanish Government lays stress on the fact that no hole was ever found in the ground by divers, such as would be occasioned by the explosion of the heavy charge of a fixed mine.

The Spanish account alleges that the loss of the *Maine* was solely due to the accidental explosion of her own magazine, but the American report leaves little doubt that an external cause induced a subsequent explosion within board.

I am, Sir, yours truly,
A CONSTANT READER.

Annagh,
Belmullet,
May 17th, 1898.

[We have already expressed in an editorial note of our March issue, our opinion, without specific information, as to the probable cause of the disaster.—ED. M. E.]

NAUTICAL HYGIENE.

To the Editor of THE MARINE ENGINEER.

SIR,—With a view to collecting information likely to promote conditions favourable to the efficiency, good health, and comfort of ships' crews, and to the improvements of nautical hygiene, I am to beg for space in your columns through which to ask the masters, officers, and engineers of ships trading in tropical and other seas to favour the committee of this society with particulars of sleeping cabins, 'tween decks, and forecastles, and of engine-room platforms, stokeholds, &c., where the engineers and stokers keep watch, the most important notes required being carefully recorded temperature of the several places mentioned, and the shade temperature of the air on deck, observed between 4 and 8 a.m. and 1 and 3 p.m.

Information as to whether the ships' decks, if of iron, are sheathed or not, and the extent to which awnings are supplied, will be valuable, and in addition, the committee ask to be favoured with copies of diaries or logs showing the hours actually employed on ships' duty under normal conditions at sea and in port, for each day during a month or so. Of course, the ship's whereabouts and the state of the weather in a general way must be given.

Information received in response to these enquiries will be treated as strictly confidential, and a resume of the particulars will be published without names or indication of origin, for the use of those interested in the Mercantile Marine.

Yours faithfully,
A. G. FROUD, Late R.N.R.,
Secretary.

Shipmasters' Society,
London, May 2nd, 1898.

RANGE-FINDERS.

To the Editor of THE MARINE ENGINEER.

SIR.—In your issue for the current month you have made an appreciative reference to our range-finder, but perhaps you would kindly allow us space to make a slight correction with reference thereto.

As your notice reads, one would gather that our Range-finder was adopted by the War Office in 1888, this is not the case.

Our's was the only single-observer range-finder that passed the preliminary trials successfully, but it failed in the final trials owing to a mechanical defect. The instrument adopted was the two-observer range-finder of Major Watkin.

It is by the Admiralty that our instrument, in a much improved form, has been adopted.

The last sentence in your notice should read "Their's was practically the only naval range-finder manufactory in the world."

Yours faithfully,
BARR AND STROUD.

250, Byres Road, Glasgow,
May 5th, 1898.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from April 13th to May 12th, 1898.

8429 D. Cameron, F. J. Commin, and A. J. Martin. Valves.
8436 W. P. Thompson (F. G. Nielson, Germany). Raising vessels.
8444 R. Webster and G. Taylor. Piston valves.
8502 F. Lobnitz. Hopper dredgers and barges.
8535 A. J. Boult (T. Mc N. Righter, United States). Pipe wrenches.
8538 A. J. Boult (T. Mc N. Righter, United States). Nut locks.
8556 C. Paul. Submarine vessels.
8569 W. P. Thompson (F. W. Spacke, United States). Steam engine governors.
8608 E. P. Waggoner. Removing oil from steam.
8614 C. E. Olsen. Propellers.
8622 D. G. Martens. Discharging lines for saving life at sea.
8629 A. Forster. Controlling supply of feed-water.
8663 W. P. Thompson (J. P. Serve, France). Engine cylinders.
8669 K. A. Nilsson. Life belts.
8686 R. Nuttall and H. P. Roberts. Friction clutches.
8691 E. J. Robertson. Rowlocks.
8719 C. C. Wampler and B. D. Bloom. Rotary engines.
8757 W. C. Carter. Rudders for ships.
8770 J. Seel. Life-saving and swimming shoes.
8782 A. Phillips. Ships' windows.
8788 S. E. Walker. Ships' propellers.
8789 J. Howie. Ships' telegraph regulating gear.
8814 H. F. Phillips. Water-tube steam generators.
8865 W. R. Caldwell and J. Kennedy. Steam generator.
8888 C. R. Wedelin. Dredging apparatus.
8892 W. P. Thompson (H. M. E. Barclay, Norway). Marine transport.
8919 H. Schofield and O. P. Macfarlane. Boilers.
8922 C. W. Vollmann. Valves.
8931 S. Willoughby. Steam boiler furnaces.
8944 J. Bailey. Steam generators.
8960 N. Hurst and W. Cox. Folding propeller.
8968 F. W. Zimer. Facilitating boat management.
9056 W. E. A. Jennings. Steam pipe safety valve.
9097 C. M. Johnson. Valves.
9107 E. T. Ferrier. Automatic floating metallic packing.
9135 H. Sinclair. Metallic packing for piston rods.
9139 H. W. J. Wilkinson. Water-tube boilers.
9144 W. Pilkington. Weldless tubes.
9156 J. Dandy. Ventilating steamships.
9166 R. P. Thorpe. Ships' Propellers.
9245 W. J. Wilday and G. Howell. Wrenches.
9327 J. Marshall. Apparatus for signalling at sea.
9329 W. B. Ormston. Boats.
9352 W. Payton. Piston Slide Valves.
9378 A. C. Gand and J. R. G. Briercliffe. Lubricators.
9387 J. L. Grandison and W. Pickett. Sight-feed lubricators.
9396 G. J. C. Fairholme. Piston-valve packing.
9397 J. Grigg. Water-tight ventilation valve.
9443 H. H. Lake.—Société Anonyme des Ateliers Germain, Belgium. Engines.
9458 W. Holmes. Ships' hatch-batten.
9465 N. G. K. Husberg. Screw propellers.
9468 W. J. Calder. Rotary engines.
9489 T. Saunders. Cleaning the inside of tubes.
9509 W. P. Thompson (J. E. England and C. J. Bousfield, United States). Adjustable pipe wrench.
9575 H. C. Walker and C. W. Hildred. Cranes.
9621 J. Mc Dade. Water tube steam boiler.
9622 H. Berry. Metallic plate-bending machinery.
9678 W. Carr. Steamships.
9684 C Leistner. Utilising rise and fall of the tide.
9716 E. C. F. Otto and E. C. F. Otto, jun. Propelling boats.
9722 C. Jones and W. Scott. Supplying feed-water.
9731 P L. Isaac. Doors for watertight bulkheads.
9740 T. Blears. Hydraulic valves.
9757 R. Lowe. Distance finder for steamships.
9767 D. Cameron, F. J. Commin, and A. J. Martin. Valves.
9803 A. Peugeot. Governing internal-combustion engines.
9847 A. Mac Laine. Piston packing.
9853 W. E. Plummer. Metallic packing mechanism.
9855 O. Brunler. Internal furnaces for steam boilers.
9861 A. J. Martin. Valves.
9867 C. H. Bryant. Internal combustion engines.
9868 R. Archer and D. A. Shaw. Metalling packings.
9909 C. L. E. Melsom, O. R. Ullstrom, and R. C. Taylor. Method of regulating furnace draughts.
9916 J. H. Barry. Submarine boat.
10029 F. Klein. Valve gear for steam engines.
10032 D. Urzua-Cruzat. Submarine boats.
10099 H. M. Goodman. Wave and tidal motor.
10104 C. H. Fox. Generating steam for boilers.
10112 J. Proctor. Mechanical stokers.
10135 E. P. Plenty, jun. Clutches for marine engines.
10160 A. B. Wilson. Steam engines.
10273 G. Beach. Compasses.
10303 W. H. Caporn. Steam engines.
10317 W. H. Wilson and R. B. Mitchell. Steam engines.
10386 G. Monseur. Lubricators.
10403 C. Hasse. Anchors.

10415 J. A. Schaeffer. Boiler.
10459 J. Atkinson. Water gauges for boilers.
10494 N. G. K. Husburg. Propelling vessels.
10517 J. Stumpf. Corliss gear for steam engines.
10521 H. A. Cutler. Recording the level of water.
10531 A. S. Mills. Supplying fuel to boiler furnaces.
10537 W. Ellis. Engine packings.
10541 H. C. L. Holden. Automatic lubricators for engines.
10551 J. Lewis, J. Lewis, jun., and A. Lewis. Trawlers gangway frames.
10552 A. Dobson. Valves for steam engines.
10563 W. J. Greaves. Furnaces for steam boilers
10586 N. Wilts. Rotary engines.
10604 J. Mitchell, sen. Lifeboats.
10608 H. H. Lake (P. C. F. Hoffmann, Germany). Buoys.
10622 G. H. Kendall and R. Gee. Safety valves.
10623 G. H. Kendall and R. Gee. Valve for boilers.
10641 H. Blanke. Gauges.
10655 R. J. Wilson and A. E. Kitsell. Boilers.
10665 H. Schofield and C. Jehan. Valves.
10680 H. H. Lake (Hygienic Refrigeration Co., United States). Rotary pumps.
10701 J. Robinson. Ascertaining the speed of engines.
10759 L. Lewis. Preventing boiler incrustation.
10855 J. I. Brooker. Flanged furnace flues.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

April 23rd, 1898.

Amerooden, A. R.	2C	Glasgow
Archer, Wm. ..	1C	Dundee
Barwick, E. R.	2C	W.H'pool
Burman, Albert	2C	Cardiff
Byles, B.	2C	London
Campbell, D. K.	1C	Glasgow
Clark, Alex.....	1C	London
Cochran, Jas. F.	2C	Dundee
Cochrane, W. B.	1C	Glasgow
Crocker, G. A. J.	2C	Cardiff
Dobson, Harry	1C	,,
Donking, Jas. A.	2C	W.H'pool
Frank, Wm. ..	1C	,,
Gibb, Wm.	1C	Liverpool
Gilbertson, H. A.	1C	N.Shields
Gillespie, Arthr.	2C	Dundee
Greenlees, D. ..	2C	Glasgow
Harris, R. H...	2C	Cardiff
Howe, David ..	2C	Dundee
Hyde, A. C. ..	1C	Liverpool
James, Alex. A.	1C	N.Shields
Jones, Jno. W.	1C	Liverpool
Keith, Wm. F.	1C	Dundee
Keyden, James	2C	Glasgow
Lee, Alfred	1C	W.H'pool
Macara, A. S...	1C	Glasgow
Macdonald, Wm.	1C	London
Macfarlane, R. H.	2C	Glasgow
Macpherson, D.	2C	Liverpool
Marshall, Alex.	2C	Glasgow
Mason, F. K. ..	1C	W.H'pool
Mason, James..	2C	,,
McDonald, Jno.	2C	Glasgow
McGregor, D...	1C	Cardiff
M'Culloch, D...	1C	Glasgow
Michael, E. R.	2C	,,
Morris, Thos. A.	1C	London
Newton, Peter	1C	Cardiff
Richmond, M.	1C	W.H'pool
Robertson, G. F.	2C	Dundee
Rolfe, Hy. Jno.	1C	London
Roughead, Peter	2C	Glasgow
Scotson, Wm. E.	1C	W.H'pool
Shaw, Alfred ..	1C	,,
Stanger, Alfred	1C	Glasgow
Swan, Wm. S..	1C	W.H'pool
Thomson, A. ..	1C	Glasgow
Thomson, Geo.	1C	Cardiff
Topfield, Jno. C.	2C	S'hamptn
Waine, Jno. T.	1C	Liverpool
Walker, Jno. T.	1C	W.H'pool
Welch, Thos. ..	2C	Glasgow
Wilson, Alex. ..	1C	N.Shields
Wilson, Robert	2C	Glasgow
Wolfe, R. J. ..	2C	Cardiff
Young, Jno. B.	2C	Glasgow

April 30th, 1898.

Adams, H. J...	1C	N.Shields
Cart, Geo.	2C	Hull
Chapman, W. C.	2C	S'nd'rl'nd
Gerrie, Robt. A.	2C	Aberdeen
Gibson, A. E...	2C	S'nd'rl'nd
Gordon, Wm...	2C	Aberdeen
Govan, A. J. ..	2C	Liverpool
Howard, G. W.	2C	Hull
Hunt, Robert ..	2C	,,
Jackson, J. C...	1C	N.Shields
Keys, James W.	1C	Aberdeen
Le Boutillier, E.	1C	London
M'Namee, Alex.	1C	Liverpool
Morrison, J. D.	2C	London
Morton, John ..	1C	S'nd'rl'nd
M'Tavish, Alex.	2C	London
Nairn, A. C. ..	1C	,,
Nicholson, G. D.	2C	Liverpool
Plowright, John	1C	Hull
Robinson, T. T.	1C	,,
Slater, Douglas	1C	S'nd'rl'nd
Stubbins, W. G.	2C	N.Shields
Tully, John....	1C	S'nd'rl'nd
Wainwright, J.	2C	,,
Wass, Walter E.	2C	London
Wilson, P. W...	1C	S'nd'rl'nd
Woolway, Wm.	2C	Liverpool

May 7th, 1898.

Addie, Thos. M.	1C	Liverpool
Bowman, David	2C	Glasgow
Brown, Alex. ..	2C	,,
Brown George..	1C	N.Shields
Cadogan, C. R.	2C	Cardiff
Carnaghan, J...	1C	Glasgow
Dobbie, Thomas	2C	,,
Duncan, John ..	2C	Glasgow
Dunn, Robert ..	2C	,,
Gargalos, C. G.	1C	Liverpool
Griffiths, Elias	2C	Cardiff
Gyles, Hannibal	2C	S'h'mptn
Hannsford, F...	2C	Cardiff
Harris, Thomas	2C	S'h'mptn
Hobbs, Ceo. C...	1C	,,
Jones, James ..	1C	Cardiff
Jones, Wm. B.	2C	N.Shields
Jopling, T. E...	1C	London
Kidd, Robert ..	1C	Cardiff
Kirkham, S. ..	2C	Liverpool
Macfarlane, J. .	2C	N.Shields
Macfarlane, Wm.	2C	London
Mannox, Wm...	1C	,,
Mather, Richard	1C	S'h'mptn
Meldrum, John	2C	N.Shields
Miller, James E.	1C	Liverpool
Mitchell, A.....	2C	Aberdeen
M'Kee, R. J. ..	2C	Liverpool
Robertson, J. ..	1C	Glasgow
Rooke, Percy P.	1C	London
Rowlinson, G...	2C	N.Shields
Smart, Wm. H.	2C	Glasgow
Smith, George	2C	N.Shields
Soldat, John H.	2C	Liverpool
Stirrat, Alex. Y.	2C	Glasgow
Thomas, Wm. G.	2C	Cardiff
Tighe, Thos. W.	2C	N.Shields
Towler, F. J. ..	2C	Cardiff
Wilson, A. M...	2C	N.Shields

May 14th, 1898.

Adam, James ..	1C	Greenock
Anderson, J. ..	1C	London
Atkinson, Jno.	2C	N.Shields
Bathgate, H. R.	2C	Liverpool
Begg, James S.	1C	Leith
Bolam, Jno. C.	2C	N.Shields
Brown, J. R. G.	2C	Liverpool
Clarkson, David	2C	Greenock
Creighton, A. ..	2C	Leith
Dixon, Jno. ..	2C	Greenock
Doods, Wm. ..	2C	N.Shields
Douglas, Jno. ..	1C	Greenock
Duff, Jno.......	1C	,,
Eason, James ..	2C	Leith
Frame, Alex. F.	1C	Greenock
Fullarton, Jno.	1C	,,
Gedney, Alfd. ..	2C	N.Shields
Green, Jno. C.	2C	Liverpool
Hawley, J. C. ..	2C	Hull
Hendry, James	2C	Greenock
Hudson, E. S...	2C	Liverpool
Knowles, L. ..	2C	,,
Malcolm, D. L.	1C	London
Marshall, Peter	1C	Greenock
M'Call, David..	2C	Liverpool
M'Kenzie, Robt.	1C	Hull
M'Quarrie, Niel	1C	Liverpool
Nicholson, S. R.	2C	N.Shields
Nyberg, C. M...	1C	Leith
Pattison, Geo...	1C	N.Shields
Ratsey, V. B. ..	2C	London
Ross, Donald ..	2C	Leith
Ross, James ..	2C	,,
Scarfe, Wm. ..	2C	N.Shields
Simpson, Jno.	2C	Liverpool
Stodart, J. M. ..	2C	Leith
Youngson, Peter	2C	N.Shields

May 21st, 1898.

Allan, Leonard..	2C	Glasgow
Andrews, Frdk.	2C	Liverpool
Arcus, James W.	2C	London
Arnott, Robt. ..	2C	Glasgow
Batts, Hy. Jas..	1C	Cardiff
Black, Alfred ..	2C	W.H'pool
Brawley, W. T.	1C	Cardiff
Brown, Robt...	2C	Glasgow
Bucknall, E. J.	2C	Liverpool
Cameron, Geo..	1C	Glasgow
Cass, Jno. J. ..	1C	W.H'pool
Chisholm, Geo..	1C	Dundee
Corless, Jno. W.	1C	London
Craig, Jno. M...	1C	Glasgow
Davies, Enoch..	2C	Cardiff
Evans, E. J. ..	1C	,,
Fielding, Harry	1C	W.H'pool
Forbes, Chas. W.	1C	N.Shields
Forster, Thos...	1C	,,
Gale, Jno.	1C	London
Garratt, Jno. G.	2C	Liverpool
Gillet, Jno. N...	2C	,,
Griffiths, H. T.	2C	Cardiff
Hall, Chas. P..	1C	London
Hardman, H. ..	2C	Liverpool
Harris, S. E. ..	2C	London
Hood, Thos. O.	2C	W.H'pool
Hornigold, H. W.	1C	,,
Hunting, P. R.	2C	N.Shields
Mackenzie, J. T.	2C	Glasgow
Maxwell, A. M.	2C	,,
M'Cance, Jno...	2C	,,
Neill, Wm.	2C	W.H'pool
Parkhill, Joseph	1C	Glasgow
Patterson, H. G.	1C	Cardiff
Penny, Chas. F.	1C	W.H'pool
Phillips, F. J...	2C	,,
Pimblott, J. G.	2C	Liverpool
Plenty, J. B. ..	1C	Cardiff
Porter, Jno.....	2C	N.Shields
Pugh, W. G. T.	2C	Cardiff
Reid, Alxr.	1C	Glasgow
Robinson, T. W.	2C	N.Shields
Sherborne, A. J.	2C	Cardiff
Smith, Henry C.	2C	Liverpool
Stirling, Jno. ..	2C	London
Townson, P. E.	1C	,,
Waddington, G.	2C	W.H'pool
Yorston, Thos..	2C	N.Shields

Catalogue.—We have received from Messrs. Lancaster & Tonge, Limited, of Pendleton, Manchester, a catalogue containing particulars of their specialities. These include steam traps, steam dryers, spiral wave and serpent spring pistons, and various forms of metallic packings. The "Lancaster" metallic packings have been put on the market to meet a want for a metallic packing which shall be at once simple and at the same time perfectly efficient. In many of the metallic packings hitherto made, the metallic blocks are kept in position against the rod by means of a number of very small springs, which are troublesome to manipulate and easily lost, thus causing much inconvenience. In the "Lancaster" packing, these are replaced by one or, in larger packing, by two springs, which, by completely encircling the blocks, press them to the rod with a perfectly equal measure, at the same time leaving them free to give any oscillation which may occur owing to the rod being out of truth with the cylinder. The spring is capable of being adjusted without taking the packings off, and can be tightened in three minutes after the outer case has been removed.

The Marine Engineer.

LONDON, JULY 1, 1898.

THE influence which the live-steam feed-water heater has in promoting evaporation may be better explained now since the effect of circulation has been properly shown by the experiments made by Professor Ser and published in the paper read by Messrs. Halliday and Seabury before the Institution of MarineEngineers. Professor Ser showed that the more rapid the movement of water through a tube surrounded by a source of heat the more rapid would be the absorption of heat through the walls of the tube by the water. That is something to begin with. Now consider the water in a boiler when no feed-water is being supplied, and heat is continually being applied, and steam has been generated for some time, then all the water is very nearly at the same temperature. When all the water is at the same temperature the circulation of the water is normal. That circulation will go on in the same way. It will be the circulation necessary for the generation of steam from water and that only. It will be the circulation necessary for the generation of steam from water at the sensible temperature of the steam, and it will depend for its movements on the manner in which the boiler is fired. If water be fed into the boiler at a different temperature from that of the water at which steam is generated, it will naturally disturb the circulation of the water from which steam is being generated. If water is introduced at the same temperature as the water in the boiler, then, however it may be introduced into the boiler, it will not disturb the circulation, since the density of the water in both cases is the same. If water be introduced into the boiler in the direction of the current at a quicker rate than the current it will promote circulation if slower, or in the opposite direction it will retard circulation. This is the influence of the inflowing water on the current of circulation. But it will have a second influence. The speed of the current will also determine the speed of the water over the hot surfaces of the plate. Whatever retards the current will retard its motion over the surface of the plate, and therefore lower the co-efficient of transmission of heat into the water. Whatever increases the current will increase the speed over the hot surface of the plate, and therefore will increase the co-efficient of transmission of heat. The temperature of the feed will therefore exercise a great influence over the quantity of heat which is transmitted from the flame on one side of the plate to the water on the other. But there is another thing which will affect the circulation, and therefore the speed of the water over the hot surfaces, that is, the type of boiler. A Scotch boiler will not have so rapid circulation of water as a water-tube boiler which provides special channels for the water to run through. A Scotch boiler cannot possibly have the water, or so much of it, running so rapidly along the hot surfaces. A Scotch boiler cannot, therefore, have anything like so great a co-efficient of transmission as the water-tube type. So we see then the transmission of heat depends first on the effect of the temperature of the feed in the circulation, and secondly on the type of boiler. But there is a third cause. It will be observed that when water is descending the down-comer of a model water-tube boiler with glass tubes no bubbles of steam come from it and rise to the surface. The bubbles only rise in the up-comer. That is because the pressure is getting less and less as the water rises in the up-comer, and is getting greater and greater as the water descends in the down-comer. The water in the up-comer is getting lighter in pressure and springing into steam. It is coming just through the boiling point. And it is a principle that when water is coming through the boiling point it absorbs sometimes three times as much heat then as it does at other temperatures. Now, the water-tube boiler lends itself peculiarly to the arrangement that water is circulating and always at a period of the circulation coming through the boiling point. This, then, is a third cause why steam is so rapidly generated in the water-tube boiler. With feed sent into the water-tube boiler cold there would be a retardation of circulation and a hindrance to it so rapidly coming through the boiling point. With feed-water sent in hot there will be no hindrance. It comes then to this, that hot feed-water does not upset the normal state of circulation, and thus allow the water to go as quickly over the hot surfaces as possible, nor does it prevent or hinder as much water as possible always going through the boiling point, and so absorbing great quantities of heat then. To sum up, hot feed-water promotes rapid motion of the water over the hot surfaces, and promotes great quantities of water continually passing through the boiling point.

THE rapid introduction of acétylene gas evolved from carbide of calcium, by contact with water, mostly used at present for purposes of illumination, has, however, brought forward great possibilities as to the storage of gas supply for other purposes than illumination, such as for power purposes. It is generally recognized that gas engines are a most safe and convenient form of power motors, particularly in the hands o amateurs, for small supplies of power such as in motor cars or in launches. In both cases the heavy weight of the boiler is dispensed with, and also the constant attention as to water-feed and stoking. The main difficulty in the application of gas engines for such purposes has been to carry or obtain the necessary supply of gas. This difficulty is now solved by the portable character of the carbide of calcium, each pound of which is equivalent to a generation of 28 cubic feet of gas, and as 20 cubic feet of gas is reckoned a handsome allowance for one indicated horse-power per hour in a gas engine, a large quantity of accumulated gaseous horse-power can be carried in the form of solid carbide of calcium, which is ready immediately to be converted by water into an explosion agent for a gas engine or for illumination. It but requires that the market cost of the carbide of calcium should be reduced to create a very much larger demand for acétylene gas, either for power or illuminating purposes. There are many situations in which gas engines would be employed, but for the difficulty of obtaining the supply of gas. Oil or petroleum explosive engines have usually been substituted for gas engines where a supply of gas was not attainable, but the tendency to clogging and choking of such engines with the residual products of the oil has been so great that they have not been favourites.

It has been decided that the Autumn Naval Manœuvres are not to take place this year owing to the disinclination of the Admiralty to entrench for such manœuvres upon their present stock of coal whilst the Welsh coal strike is in progress. This country is assured that the present stock of coal in hand is as large as usual, in fact larger, but the postponement of the manœuvres is decided on merely by way of precaution. It is difficult at first to understand that any excess demand of 50,000 tons of coal, whilst the northern and midland coal-fields are in full working order, could make any subject of serious consideration to the Admiralty, but we see that from recent trials it is little use to expect even moderate speeds from our war vessels with other than Welsh coal. It is reported that the *Sappho*, going out for her trial with northern coal, was soon metamorphosed by the entire disappearance of the yellow paint upon her funnels. Owing to the imperfect combustion of the northern coal, the products of combustion re-ignited when issuing from the funnel, and it is stated that she had flames 12 feet high proceeding from the tops of her funnels. An order has been given for the destroyers to fill up with Welsh coal only; and, considering how difficult it is with other coal to prevent the destroyers from signalling their approach by a column of fire at night, it would appear to be absolutely impossible to use them in manœuvres with anything but Welsh coal. There may thus be very serious grounds for the unexpected decision of the Admiralty, and it is appalling to think that blind and unreasoning trade disputes may affect to such an extent both the building and construction of our iron-clad Navy, and their power to manœuvre as in time of war. It would appear as if the Government must themselves become colliery owners, and supply a Government working staff to render themselves and their Navy independent of industrial quarrels.

The death of Mr. Samuel Plimsoll has removed from amongst us a man who has been, perhaps, the most abused by those whose interests he was attacking, and at the same time the most lauded by those who consider the protection of humanity to be far above private or commercial interests. We think now that it is generally recognized that his persistent and enthusiastic efforts for the protection of seamen have resulted in a general benefit to the class of shipowners and British shipping at large. The fact that his efforts have resulted in practical legislation, now not only accepted without a murmur by British shipowners, but even voluntarily sought for by foreign shipowners, has proved that abuses must have existed, and that in the main Mr. Plimsoll was right in his views. His very enthusiasm and single purpose, obscured as it was at first by his total practical ignorance of shipping and the shipping trade, often caused him to break out in denunciations and invective totally unsupported by proof, and whereby he gained much odium and abuse. But beneficent legislation which shall put all competitors on the same basis, only serves to protect those honest traders who desire to carry on a trade with safety to their goods and people, and but presses hardly upon those who are reckless of their reputation and the lives of others, and who, from want of proper legislative control, but serve to degrade prices and the condition of trade to the injury of those who would trade honestly. As a result, we may say that the present uniformly high character of British ships and British shipbuilding is due very largely to the legislation originated by Mr. Plimsoll, and that the immediate action of such legislation when first originated, though galling to those who had obsolete and unseaworthy craft, that they could not work with a profit under such rigid conditions, but served to purge the Mercantile Marine of a class of property that was both a danger and a disgrace, and a stumbling-block in the way of honest owners and traders. We, therefore, add our mite of adulation to the memory of a man who devoted the best part of his life to the good of others, and who at the same time helped to raise and maintain the seaworthy character of British shipping, of which we are now, as a nation, so proud.

MUMFORD'S OF COLCHESTER.

THE works of Mr. A. G. Mumford, of Colchester, have become famous lately because of his water-tube boiler taking a place in the front rank of the express type. The trials of the boilers fitted in the *Salamander*, moored at Devonport, have shown what they are capable of doing. Their performance, even with inferior stoking was, doubtless, excellent. When a boiler gives an evaporation of 11·47 lb. of water from, and at 212 degrees when burning, at the rate of 25 lb. of coal per square foot of grate, and 8·16 lbs. from, and at 212 degrees, when burning 70 lb. of coal, very little fault can be found with it. Mr. Mumford's boiler is different from any other of the express type, different in design, and quite original in conception of many of its advantageous parts. We give a double-page drawing of the boiler, its arrangement, and its fittings. We show end-view and transverse section, with side view and longitudinal section. It will be observed that the grate is very narrow and falls under D. K. Clark's principle, that the smaller the grate the better, so long as it does its work properly. A very fierce fire is kept up in the grate of Mr. Mumford's boiler. It will be noticed in the sectional end-view that there is a diaphragm, of a refractory material, going from end to end of the boiler, situate about the middle of the tubes. The flames rise from the fire, circulate amongst the tubes, and beat against the inside of the refractory lining. When they get to the back of the boiler they turn and come towards the front, circulating amongst the outside tubes as they do so. They then go through the up-take towards the chimney at the front. The forms of the tubes and of the top and bottom water vessels are shown in element. Each has a branch-pipe, the one to connect it with the bottom water-drum, the other to connect it with the top steam-drum. These branches, shown in sectional elevation, are narrow, but serve to mix the water more efficiently. There are two large down-comer pipes at the back-end of the boiler connecting each lower drum with the steam-drum. In the new type of boiler which Mr. Mumford is making the branch pipes at the bottom are entirely done away with. The bottom-chambers serve both as water-vessel and as end-tube plate. It is simply a long tank of about the same end shape as that shown in element. The tube ends are easily got at by taking off the plate opposite them. The boiler is thus made free of many of its disadvantageous joints and much simplified. These boilers have 2,000 square feet of heating surface, and 45 square feet of grate. The test was up to 300 lbs. cold-water pressure. Steam can be raised in the water-tube boilers from water at 55 deg. to 130 lbs. pressure in 20 minutes from the time of lighting the fire. Such is the Mumford boiler.

The office of Mr. Mumford is on one side of Culver Street and the works and drawing office on the other. Mr. Mumford manages everything himself, and the peculiar feature of the place is the interest in the business which he has the faculty of inspiring in all his men. The chiefs of each department are continually trying to improve and simplify in construction and principle of action what they are already at, or else inventing something new to accomplish in a better way the same thing. There is Mumford & Antony's Duplex Pump, which was long famous in the engineering world before the Mumford Boiler became so. There are improvements made in the new boiler by another chief draughtsman. There is a little launch-boiler, the original idea of a shop foreman, and there is the controlling brain of Mr. Mumford himself which inspires, receives, considers, and perfects each new improvement brought before him. Each chief of each department is imbued with the same spirit.

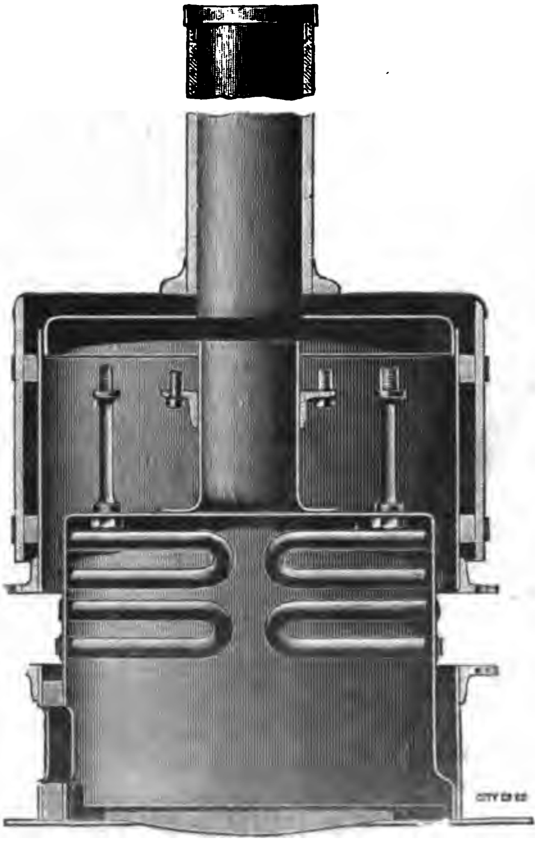


Fig. 1.

When one enters it is into the machine shop. The machines are ordinary lathes, planing, slotting, milling, and shaping machines. They do not require any further description than to say that they are capable of performing efficiently the work set them. Towards the end of the turning shop is the erecting shop, where pumps, launch-boilers, and engines, and other machines are being finished at the vice, fitted up, and erected. On the left is another large shop for erecting boilers. The trials also take place in this shop alongside of pumps and other apparatus fitted conveniently for the purpose. Next to this is the forge. On the right of the machine shop is a large new shop, newly erected, meant for vice and fitting work. It is almost as large as the machine and erecting shop, and will enable Mr. Mumford to cope with the new and extra work. The drawing office is at the entrance, and Mr. Mumford takes a great deal of pride in the work of the drawing office. As in the shops, the draughtsmen give their whole attention to making of new improvements in the machinery manufactured in the works. The machinery and improvements are the product of the staff.

Turning now to the products of the works. The most famous of his manufactures is, of course, the new water-tube boiler. A most important adjunct to this is his automatic feed-water controlling apparatus. A section of it is shown in plate supplement. It consists of a tank with water in it at the same level as the water is in the boiler. The connection of this with the boiler being through the pipe shown at the bottom of the tank. Inside there is a float which controls the valves connecting feed-pump and boiler. At the bottom of the valve-place is a wheel for controlling the adjustment for the water-level. There is also a water gauge fixed in an appropriate place as shown for showing the water-level. The action of the feed regulator is to shut the passage to the boiler and prevent the feed from flowing, and by that stop the feed-pump. When the water in the boiler gets lower in level, the water is released and is again free to flow into the boiler, and the pump starts off automatically. The whole arrangement of boiler, automatic feed, and pump is shown in plate. Full drawings of the feed-pump used with this water-tube boiler is shown in plate.

There is another water-tube boiler of the vertical type suitable for launches, a sectional view of which is shown in Fig. 1. It is of the vertical type and has a water jacket and fire-box like ordinary vertical boilers. But it differs in this, that from the walls of the inner shell protrude U tubes through which the water can circulate from the water-jacket. The U tubes are made of brass and can easily be taken out, cleaned, and refixed in a short time. The boiler is tested to 240 lbs. hydraulic pressure, and works at 120 lbs. steam pressure. It is lagged with mahogany or teak to prevent radiation.

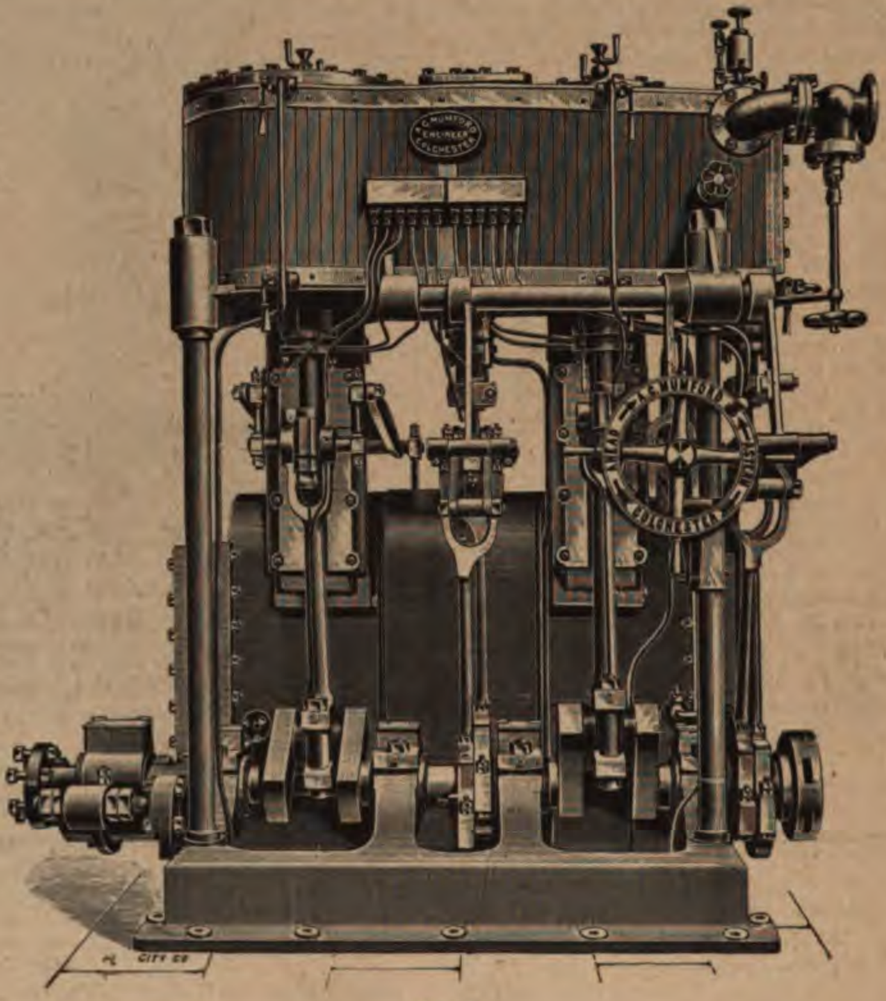


Fig. 2.

We also illustrate one of Mr. Mumford's compound condensing engines, Fig. 2, of which he makes a number of types for marine purposes. It will be observed that the bed-plate is of simple construction. The cylinders are supported at the front with polished wrought-iron columns, and at the back by the condenser and cross-head guide-plate. The oil is led to all the moving parts by pipes from an oil box in the front which is easy of access by the engineer. The bearings of the connecting rods are long, which keeps them cool when they work continuously.

We also illustrate his well-known Patent "Duplex" Steam Pump, Fig. 3. In the steam cylinders there are only two moving parts, the pistons and the large wearing surfaces given to them allow them to work a very long time without turning up or repairs being required. Each piston serves as the valve for the admission and eduction of steam to the other. Then the parts have been so arranged that the pump will start from any position, and the pump has never been known to stick or stop of its own accord. A steam cushion is given at the end of the stroke to prevent the piston from striking the covers.

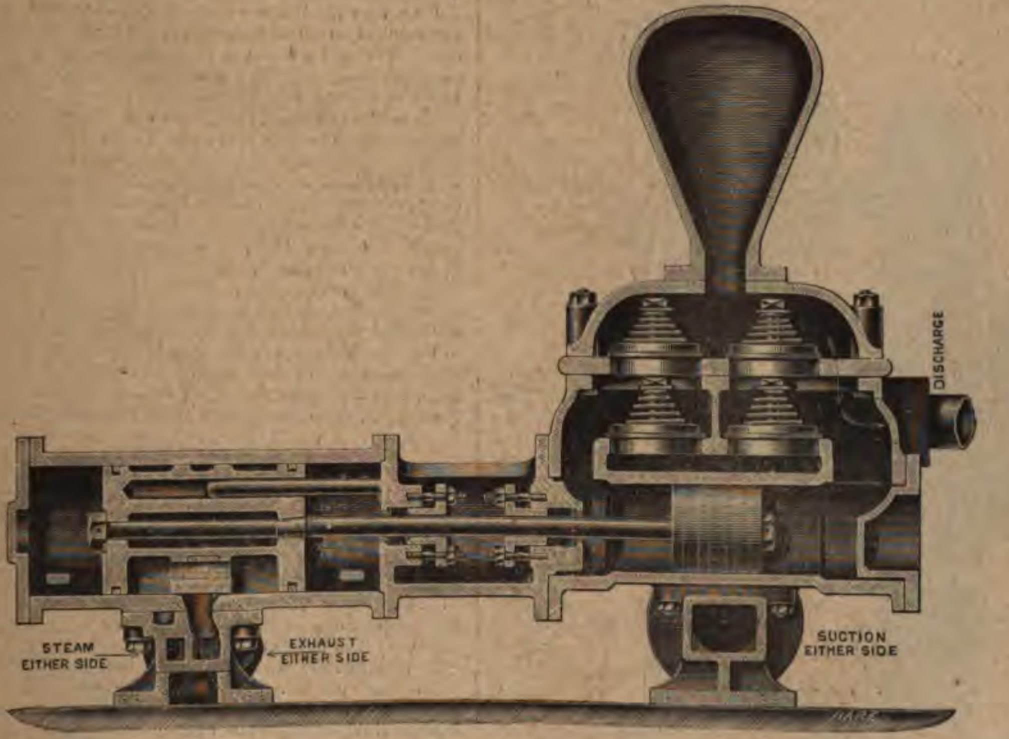


Fig. 3.

We also illustrate a bulk-head fan with attached vertical engine, Fig. 4. It is very strong and compact and goes into small space. The engines have large wearing surfaces to make them run continuously.

Besides the water-tube boiler Mr. Mumford makes single and double-flue return-tube marine-boilers. These are of ordinary construction and suitable for launches and steam boats.

An official trial was made by the Admiralty on 22nd June of one of Mr. Mumford's patent water-tube boilers for first-class torpedo boats. The trial was under the conditions that they burned at the rate of 25 lbs. per square foot of grate, and also at 50 lbs. The following are the result of trials of the water-tube boiler for first-class torpedo boat:—

Date of trial	June 22, 1898	June 22, 1898
Duration of trial	2 hours	2 hour
Grate surface square feet ..	22	22
Tube " " " ..	850	850
Gallons per hour evaporated	895·47	541·6
Coals burned in lbs. per hour	1,098	552
Lbs. of water per sq. ft. of heating surface	10·53	6·41
Lbs. of water per lb. of coal	8·15	9 88
Lbs. of coal per square foot of grate	50	25
Lbs. of coal per hour per square ft. of htg. surface	1·29	·68
Tube grate	38·6	38·6
Temperature of feed ..	58 degs.	58 degs.
Steam pressure	140	140
Air pressure in funnel (ins.)	·8	·2
Space between fire bars ..	⅝ in.	⅝ in.
Thickness of fire bars ..	⅜ in.	⅜ in.

The feed being at 58 degrees and the pressure at 140 lbs. the evaporation in the first case, when the consumption of coal is 25 lbs. per square foot of grate per hour, is—

12·92 lbs.

from, and at, 212 degrees, and in the second case, when the consumption is 50 lbs. per square foot o grate per hour, the evaporation is—

11·19 lbs.

from, and at 212 degrees. We do not know of any record of results higher than these, and it even surpasses those of the old Cornish and Lancashire boilers with their slow rates of combustion.

It will also be noted that the H.P. supplied would be very nearly half a H.P. per square foot of heating surface when the consumption is

50 lbs. of coal per square foot of grate. And that if 20 lbs. of water evaporated per hour, be taken as equivalent to an I.H.P., the boiler would supply 447 H.P. in the first case and 272 in the second.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

Corrections.

I HAVE to apologise for three printers' errors which occurred through no fault of mine in last month's Notes. There were five mistakes altogether.

Captain *Rupé's* name appeared as *Kupé*.

Sir Bache *Cunard* masqueraded as Sir Bache *Gunard*.

The old P. & O. *Ravenna* had her name mutilated beyond recognition.

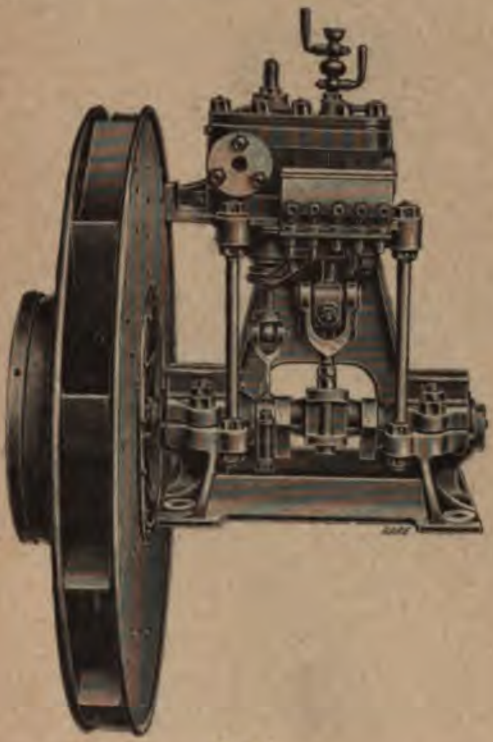


Fig 4.

And the *Fast* Canadian Service was most untruthfully described as the *First*. If it had been said to be the *Last* it might have been a pardonable alteration.

Nothing is more annoying to a writer who types his copy and who corrects his proofs than such gross typographical errors, and my readers may feel assured that I have suffered much more from the occurrence than they are likely to have done. For what to them is but a passing glance means care and thought to me.

The West India and Pacific Steam Navigation Company,

as already notified here, are now engaged in building two big steamers. They have accordingly lost no time in making ready to pass out some of their smaller boats at the other end of the scale. Three steamers are, therefore, on offer. One of these is the *Bernard Hall*, which was some time ago spoken of as possibly open to a good offer. Another is the *Yucatan*. This is a sixteen-year-old vessel from the Queen's Island Yard. Her gross tonnage is under three thousand register. But the third of the trio now offering is the second name-boat of the line—the *West Indian*—a vessel not, as I write these lines, yet seven years in the water. She is a small boat certainly, a trifle less than the *Yucatan*. But she has triple-expansion engines and was turned out from the Barrow yard.

The Cunard Line

has, since I last mentioned their fleet, disposed of two old vessels. One of these is the *Marathon*, a Napier-built ship of the mature age of 38 years. Originally of 1,784 tons gross and of 274 ft. in length, she was, in 1872, lengthened upwards of 60 ft., whereby her tonnage was increased to more than 2,400 tons gross register. At the same time Messrs. J. & G. Thomson, of Clydebank, provided her with compound engines in place of the old single-expansion machinery with which she was originally fitted. This vessel has gone to an Italian port, presumably for the scrap heap.

The other vessel sold is a comparatively modern ship. That is to say, she was built as recently as the year 1871. This is the *Trinidad*, of 1,900 tons, built by Messrs. J. & G. Thomson, of Glasgow, who fitted her with compound engines which have served the steamer ever since she came out. Her fate had scarcely been more glorious. For she has been sold to Germans, and has gone to a port in the Fatherland to load coal. Thence she sails for the Far East, and, in Germany's new Chinese port, will be dismantled to serve as a floating store.

I am very glad to see that the Cunard people are really at last getting rid in so determined a way of the vessels which swell their bills and do not tend to increase their dividends. It is greatly to be hoped that this discarding policy will be followed up under the new management.

Meanwhile Messrs. C. S. Swan & Hunter have launched for the company the steamer *Ultonia*. She is fully described elsewhere. Suffice it to say here that she is a twin-screw boat of 11,000 tons dead-weight capacity. She has the distinction of being the first vessel built for the line on the north-east coast. This in itself is a claim to our notice. But she has others. She tells us plainly enough that, having given up the passenger business to the Mediterranean, the Cunard Line is about to retire from the Boston trade as well. For she is a cargo boat indeed, though undoubtedly a very fine vessel of her class, and one that may well bring the favour of cattle-shippers to the line. This addition to the fleet follows out the policy adopted when the *Catalonia* was dismantled as to her saloon accommodation, and when the *Carinthia* and *Sylvania*—the two newest boats in the company's Boston service—were built without provision for cabin passengers.

The China,

of the P. & O. Company, has spent nearly three months on the Azalea Reef. The Court of Inquiry at Aden has suspended the certificate of her commander and has censured the second officer This in regard to the circumstances under which the vessel went ashore. The sufficiency of the grounds on which the Court did what it did I am unable to discuss. For, like the chairman of the P. & O. Company, at the recent meeting, I have not the report of the proceedings at the Inquiry before me. I cannot, therefore, join with him in his remark that the conduct of the master was "as inexplicable as it was culpable." The words are neither sense nor justice. The master—according to Sir Thomas's own shewing—had a thirty-five years unblemished record. Surely this might have raised some small presumption in his favour—at least till the case against him was disclosed. Did Sir Thomas never make a mistake in his life? Why should he cast stones at certificated officers without knowing the circumstances under which casualties occur?

So the *Sobraon* and he *Assaye*, the new P. & O. boats of the Calcutta line, are to be twin-screw. How gently Sir Thomas breaks to himself the inevitable conclusion that he will one day have to build twin-screw mail boats whether he likes it or not!

The White Star Line,

Without waiting for the advent of the new *Oceanic*, have already practically achieved the shelving of the old *Adriatic*. I cannot mention her name in this connection without deploring the fact that the advance of time should have caused us to be obliged to speak somewhat contemptuously of this old ship. For she held the blue ribbon of the Atlantic in her day, and for many years was a favourite with passengers, being rightly considered a fast, luxurious, and comfortable ship. Comfortable she will be as long as she floats, but the march of progress has left her far behind in the other two qualities.

For years, her only appearance on the Atlantic has been once at midsummer and once in midwinter, when each of the mail boats of the line has, in turn, had her larger overhaul. But her place for this purpose has been taken by the *Cymric*—a vessel, which, I think, will even in speed show herself superior to the *Adriatic*, whilst in size and luxury she is certainly far beyond her. It seems strange, indeed, to think that the progress of a quarter of a century has made the cargo carrier of to-day at least equal in speed and three times greater in size than the mail steamer of the earlier period.

We may now conclude that, save in the event of an unexpected disablement of one of the regular vessels at a time when the *Cymric* is not available to take her place, we shall not again have the opportunity of seeing the *Adriatic* under the Company's flag.

Publication.

From Messrs. Siebe, Gorman & Co., of Westminster Bridge Road, S.E., I have received a very interesting and well got up volume. It is their latest catalogue. But whilst it contains the usual illustrated price lists of everything appertaining to the work of the diver—and that includes many things besides his mere dress and air-pumps—it also gives a very excellent résume of the development, achievements, present position, and prospects of further advance, in the science and art of under-water work. The book is entered at Stationers' Hall, and is to be obtained at the price of two shillings and sixpence. It should be in the library of everyone who has read and appreciated Jules Verne's *Twenty Thousand Leagues under the Sea*. I might even add, "and also of everyone who holds stock in the Great Western Railway." The latter remark may possibly need explanation. What, it may be asked, can a railway company, save in its ship-owning branch, have to do with diving? The Great Western Railway Company has a great deal, in its narrowest capacity as an owner of railway lines, for which to thank Messrs. Siebe, Gorman & Co. for their inventions, and Mr. Lambert, the deep-sea diver, for his pluck and skill in using them. It may be remembered that when the great Severn Tunnel was nearing completion, and when, I should be sorry to say how many millions of Great Western shareholders' money had been sunk in it, a great inrush of water took place. No pumping power available could cope with it, and it looked as though the abandonment of the costly work were within the range of probability. A watertight door had been erected in the tunnel in view of the possibility of such a flooding as had then actually taken place. But the frightened workmen had no time to close the door before their flight to escape the raging waters. Then Mr. Lambert came to the rescue. Clad in one of Messrs. Siebe & Co.'s dresses he went down, traversed the long range of tunnel amid the floating woodwork which momentarily threatened to interrupt the supply of air on which he depended, and achieved his object in shutting the door, thus restoring to the railway company their endangered property. An illustrated description of this same diver's work at the famous wreck of the *Alphonso XII.* is also given. Details are also afforded as to the salvage of the silver from the wreck of the *Skyro*, a work recently completed, and one which involved a dive at least equal to that of the *Alphonso XII.* Reproductions of photographs of famous salvage operations are also given us. Amongst these may be cited those of H.M.S. *Howe* and H.M.S. *Sultan*. Then such interesting matters as the carrying out of the harbour works at Folkestone and Colombo are dealt with. But it is not alone with the divers' work that the book is concerned. The chief point of the book is the divers' outfit. And here great novelties seem to have been brought forward by the firm. There are interesting adaptations of the diving-bell principle as elaborated for the Egyptian and Japanese Governments. There is also the latest thing in diving suits. This seems to suggest that even Mr. Lambert's record dive may, in the near future, be surpassed by the aid of science. The suit in question is the idea of an Australian inventor, worked out by Messrs. Siebe, Gorman, & Co. Its peculiarity is the mode in which it lends assistance to the diver so as so enable him to resist the enormous pressure of water which he has to encounter at great depths. The result is achieved by the use of copper-armour in place of the ordinary dress, and by the addition of springs to enable the diver's limbs to obey his brain, instead of giving way to the pressure to which they are subjected.

Running the Blockade.

Considerable interest attached to the performance of the s.s. *Montserrat*, which, at the end of May, ran the blockade and escaped from Havannah in spite of the careful watch which the Americans were keeping. On her arrival at Barcelona excitement ran high and the officers were very enthusiastically received. I, therefore, give a few particulars concerning the vessel. The *Montserrat* belongs to the Compania Transatlantica of Barcelona, and is a steel steamer fitted with a single screw. She was built in 1889 at Stettin by the Vulcan Company, and is upwards of 370 ft. in length. Her gross register is 4,375 tons, and her original owners were the Hamburg-American Company, in whose service she was known as the *Dania*. What I think will be of most interest in regard to her is the fact that her commander told one of his numerous interviewers that she crossed on this memorable run at an average speed of 18 knots. I find that officially the vessel is credited with but the capacity to do 14 knots. Either there is a mistake somewhere or there must have been a good deal of sitting on the safety valve. But anyhow marine engineers will be very glad to hear how even on occasion 14-knot boats can be driven at 18 knots speed across the Atlantic.

As the American s.s. *Merrimac* has been making history recently, and has apparently closed her own career in doing so, a few "personal details" regarding her may not be out of place. She was a steel screw cargo-vessel, built in 1894, at Newcastle, by Messrs. C. S. Swan & Hunter, to Lloyd's highest class. Her gross register was 3,380 tons. Her dimensions were—length, 330 ft.; beam, 44 ft.; and depth, 27 ft. 6 in. So she would be a formidable obstruction in a narrow channel. She was not, however, originally known as *Merrimac*—for her first owners were Norwegian shipowners, and her port of registry was Bergen. Under the name of *Solveig* she was employed for her first three years as a general trade cargo-boat, till, on the 27th April, 1897, she caught fire when loading a cotton cargo for Hamburg at Newport News, and was first reported as "a total loss, ship and cargo." Things were not quite as bad as this, however, for two months later the remains of the vessel fetched between £9,000 and £10,000 at auction, and the new owners determined to reconstruct her. This process was effected at New York, and by the end of last year she was once more a sea-going ship. The large amount that had been spent on her allowed her new owners under the American laws to claim permission to have her placed on the United States Register, and accordingly she entered on the second stage of her career as the *Merrimac*. When the war broke out the United States Government acquired her as a collier, and it was thus that they were able to command her services when they wanted something with which to "cork the bottle" for Admiral Cervera. After what occurred on the 3rd June, when Naval-Constructor Hobson "pressed the button" and the Spanish shells were poured on the sinking vessel, it is highly improbable that she can be raised, and the Spaniards have probably already undertaken the task of dispersing the wreck.

The "Carisbrooke Castle."

The latest addition to the Castle Fleet sailed from London on Friday, the 10th June. Unfortunately for myself, other engagements prevented me from going round to Southampton in her. But I had a good opportunity of inspecting her in the London Docks. The *Carisbrooke Castle* is the largest vessel yet turned out from Fairfield for this company. She is rigged as a three-masted schooner without yards. At the first glance, perhaps, the main and mizen masts look a trifle too near together, and the single funnel seemed rather to dominate the ship as one turned the corner of the dock wall and saw her in all her bulk lying close at hand at her berth. Going on board one saw at once that she marked a new departure in Castle liners. The boats are taken off the rail and put above on a boat-deck, which forms a permanent awning to the promenade. The latter thus affords to passengers a clear promenade with an uninterrupted view and complete shelter. The deck cabins are numerous and comfortable. The boats, though put aloft, are perhaps more accessible, less obtrusive than in earlier ships, for a special winch is provided for hoisting them out. The steering gear is of the same type which has been so successful in the recent Castle Liners, consisting, as it does, of an engine working on the tiller itself and actuated by a telemotor from the bridge. The machinery, also, is somewhat different to that of any vessel as yet built for Messrs. Donald Currie & Co. It consists of quadruple expansion-engines with four cylinders actuating four cranks. These are balanced on the Yarrow-Tweedie-Schlick system, which, it is believed, obviates the chances of undue strain coming on the machinery, and so tends to avoid the vibration of which passengers complain in so many high-speed passenger ships, whilst at the same time it very much minimises the risk of breakdowns.

The points in which the comfort and convenience of passengers have been met, however, are much too numerous to mention. Amongst them I must instance the noiseless ash ejectors (See's patent) and the silent electric pumps, the continuous supply of iced water laid on all over the ship, and the cool larders which supplement the storage of the refrigerators.

The machinery has been briefly noticed. I must not forget to note that the boiler pressure is high—205 lbs.—and that, therefore, though the ship did eighteen-and-a-half knots on her trial, she will be an economical vessel in regard to the coal bills. She can, however, stow some 2,000 tons in her bunkers, and has space in her holds for double that quantity of cargo. She is manned by a crew of 220 men, under the command of Captain Robinson. She will carry about 620 passengers in the ordinary way, though, of course, as a trooper, she would easily accommodate far larger numbers. As it is, there are 220 third class and 150 intermediate berthed in the comfortable manner characteristic of the line. The saloon provision is for some 250 persons. The main saloon is forward of the engines on the main deck. It is a very comfortable and striking apartment. The walls are panelled in oak. The skylight, though rectangular as it springs from the room, becomes a circular dome as it rises to its elevation. The glass is of a very quiet tint, and the walls of the dome look cool and simple, being plain white in colour though richly carved. There is seating accommodation in this dining-room for 160 persons. The drawing room, too, is a very handsome room with a rosewood grand piano in the centre. The walls here are pannelled in satin-wood wood.

The smoke-room is aft on the promenade deck, with access from below, as well as from the level. It is a much more commodious than that of either the *Dunvegan* or *Dunnottar Castles*, and it has a very large and well arranged bar. It is lofty and cool in appearance, and it, too, is panelled in oak. Altogether we may say that the ripe experience of Messrs. Donald Currie & Co. has enabled them to make the latest addition to their fleet a great improvement on even the comfortable ships that have made and sustained their reputation with passengers to the South African ports.

A Result of the American War

has been, it is announced, to render advisable the withdrawal of the *City of Rome* from the Glasgow-New York service of the Anchor line, in which she has been engaged since she left Liverpool. Her trips have usually not extended beyond the summer season, *i e.*, from April till October. This year she did not begin work till May, and having made but one voyage, has her following dates cancelled, as the passenger traffic moving, at least from Glasgow, does not warrant her continuance at work.

The Beaver Line

Offers for sale their steamship *Lake Winnipeg*, a vessel built some nineteen years ago at Clydebank, but tripled about seven years ago, and extensively overhauled as recently as last year.

The P. and O. Company offer their old s.s. *Thames* for sale—not the Royal Mail Steamer of the same name, as one weekly shipping paper reported.

The Bristol Docks.

When I last mentioned this scheme I referred to the occurrences of November last. Then it was determined to approach the railway companies with a view to enlisting their sympathy and support on behalf of the Avonmouth Dock Extension Scheme. After deliberating till May, the Great Western has absolutely declined to favour the suggestion. Its line of argument shews that it thinks that either Portishead or Bristol itself should be the chosen spot.

Meanwhile, the November elections to the City Council have strengthened the party which desire to see the Avon dockised. But, at the discussion in June, it was shown that very substantial objections exist to the dockising plan. Under any scheme put forward for its accomplishment, the draught of water obtained would be really insufficient, and the Avon would become as insanitary as the Manchester Ship Canal, unless some very large and expensive arrangement were made for dealing with the sewage from the up-country. In the event the City Council decided to approach the Great Western again with a humble request that the railway would not thwart them in accomplishing the suggested improvements at Portishead. Meanwhile the Avonmouth Dock has been adapted to receive the s.s. *Milwaukee* and her sisters of the Elder, Dempster Line. These seem for the moment quite able to cope with any trade, even from across the Atlantic, while Bristol need think of preparing to accommodate.

The Tyne Improvement Commission

Is coming to market for money. This Corporation has already spent some five and a half millions, and it now seeks to raise another half-million at 3½ per cent. But the money in question is not to be applied to any considerable extent for the purpose of extending the facilities of the district. It will mainly be used for paying off the existing loan at higher rates of interest, and so in lessening capital charges, and thus increasing the nett revenue.

The Irish Mail Services.

From a recent statement in the House of Commons it would appear that experience of the new twin screw mail boats has warranted the City of Dublin Steam Packet Company in undertaking to reduce the contract time of passage by fifteen minutes. This is to be combined with a reduction of time by the railway company so that the transit will altogether be reduced three-quarters of an hour. Travellers to Ireland will have reason to be grateful to Messrs. Laird for the excellent work they have put into the new vessels.

The Mail Steamship "Briton"

Had a somewhat narrow escape the week before last. When homeward bound from the Cape she went on to the Shambles near Weymouth at eight o'clock in the morning during thick weather. The tide was falling, and she remained till it made again sufficiently to allow the tugs *Hercules* and *Neptune* to pull her off at 5.15 p.m. She then proceeded under her own steam to Southampton, where she arrived some four hours later. There was no question of risk to life. But as the vessel is said to have been in but 6 ft. of water, there seemed some little possibility that she might have strained herself. Happily it is reported that she has been thoroughly examined and shows no trace of injury whatever.

The "Parisian,"

Of the Allan Line, doubtless astonished many of my readers, as she did myself by the performance recorded the other day when she broke the record. For the *Parisian* has not been very largely improving on her earlier performances, and others than Messrs. Allan's have brought new and fine ships into the St. Lawrence trade—though possibly they have taken them out again.

But the record in question appeared on examination to be a somewhat qualified one. The paragraph which I saw, at least, did not tell what the time of passage was, though it did mention the hour of arrival at Quebec. Then it appears that the passage in question was a lowering of the record *via* Cape Race. As the usual passage (except perhaps very early in the season) is *via* Belle Isle, the value of this record is easily appreciated.

A Quintuple-named Ship.

Once again I have to chronicle a change of name of the vessel which during the greater part of her career was known as *La Plata*, but which is most likely to attain enduring fame from the litigation with which she was connected when her name was *Orienta*.

Even on this description it may be a little difficult for readers to follow me. So I will begin at the beginning. In the year 1879 a vessel called the *Norfolk* was built for, I believe, the Money-Wigram Line. She very soon afterwards joined the fleet of the West Indian Royal Mail Company, who re-named her *La Plata*. Them she served well for many years, and not so very long ago she was disposed of, as unsuitable for their requirements. Then she went into the public yachting business as the *Orienta*. A little while and she was in the same trade as the *Norse King*, of Newcastle. The most recent change is to the *Argonaut*, of London. On what kind of expeditions she is to be employed now remains to be seen.

The Dominion Line.

Ere these Notes are in my readers' hands, will be maintaining a fortnightly service between Liverpool and Boston with their two fine twin-screw liners *Canada* and *New England*. The *Canada*, by something like a score of round trips across the Atlantic, has proved herself a very favourite and fast boat. She holds, it appears, the Queenstown and Boston record in each direction. Her best westward run was made in September of last year, when her official time was 6 days 19 hours and 14 minutes. In May of the present year she did her best outward run, which stands at nearly an hour better than the other, being but 6 days 18 hours and 30 minutes. I much regret that I have been unable to obtain the abstract of her logs.

Her companion will be the *New England*, of which I gave a brief note a short time ago. This vessel is built, like the *Canada*, by Harland & Wolff, but is distinctly larger, being over 11,500 tons gross register. She is propelled by two sets of quadruple engines. She is a passenger boat of the highest class, as may be gathered from the fact that her main saloon will seat nearly two hundred persons. Her accommodation in the saloon and intermediate cabins, in fact, seems by no means inferior to that of the best class of New York traders, whilst she will treat the more humble class of travellers even better than they do, for she will offer them closed in rooms of a kind which in more southern voyages are spoken of as "third-class accommodation" as distinguished from the ordinary steerage. She is booked to sail on her maiden trip on the 30th June.

FIRE EXTINGUISHING APPARATUS FOR SHIP USE.

THE provision of adequate and efficient apparatus for promptly suppressing any outbreak of fire on board ship is necessarily of the highest importance, and it will, therefore, be interesting to give a few details respecting a new appliance which is being introduced by Messrs. John Morris & Sons, Salford Fire Engine Works, Manchester, and which is specially suitable for ship use, both in connection with fire extinguishing, and in cleaning operations. This invention, which has been named the "Swift" patent hand-pipe and nozzle, has been designed to take the place of the usual copper branch-pipe and nozzle. The special feature of the arrangement, of which we give a couple of illustrations, is that by its use a solid stream or spray of water, either separately or simultaneously, can be turned on, the change from one to the other, or a combined use of both, being accomplished instantly. To obtain a solid stream, the bow-handle in the centre of the pipe, shown in Fig. 1, is pressed down, and to produce a spray, the milled collar near the top of the apparatus needs only turning to the left. When it is required to shut off the stream, the operator has simply to lift up the handle, whilst to shut off the spray he has to turn the milled collar to the right. The illustration, Fig. 2, shows the nozzle at work, with a combination of the solid stream and spray. The spray can be deflected to any angle, and can be made large or small in diameter at will. The shut-off arrangement, which is entirely on a new principle, is instant in action, without giving back pressure, and the fireman has quick, complete, and easy control over the amount of water discharged, whilst he is able to shut the water off himself, without communicating with the man at the stand-pipe. We understand that the "Swift" nozzle and pipe have just been adopted by the American Navy, after searching tests with other makes. It is specially useful for dealing with fire on board war vessels when in action, and cotton, hemp, and other inflammable materials stored in the hold can be effectively wet down, while at the same time the spot where the fire exists can be played upon by a powerful stream of water. For deck cleaning purposes the arrangement also possesses many obvious advantages to which it is unnecessary to refer in detail.

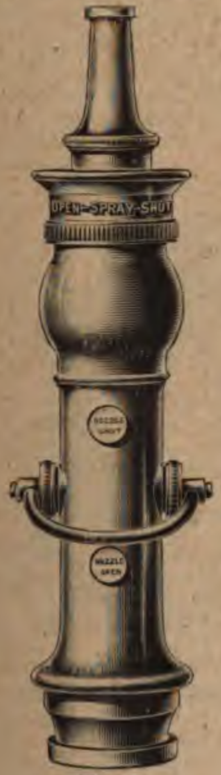


FIG. 1.

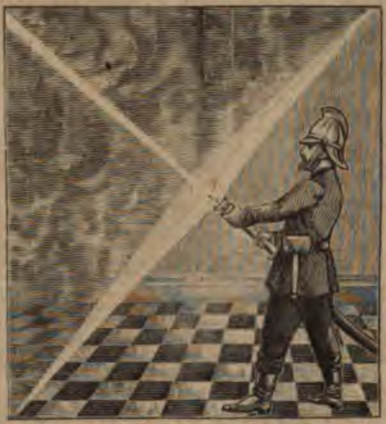
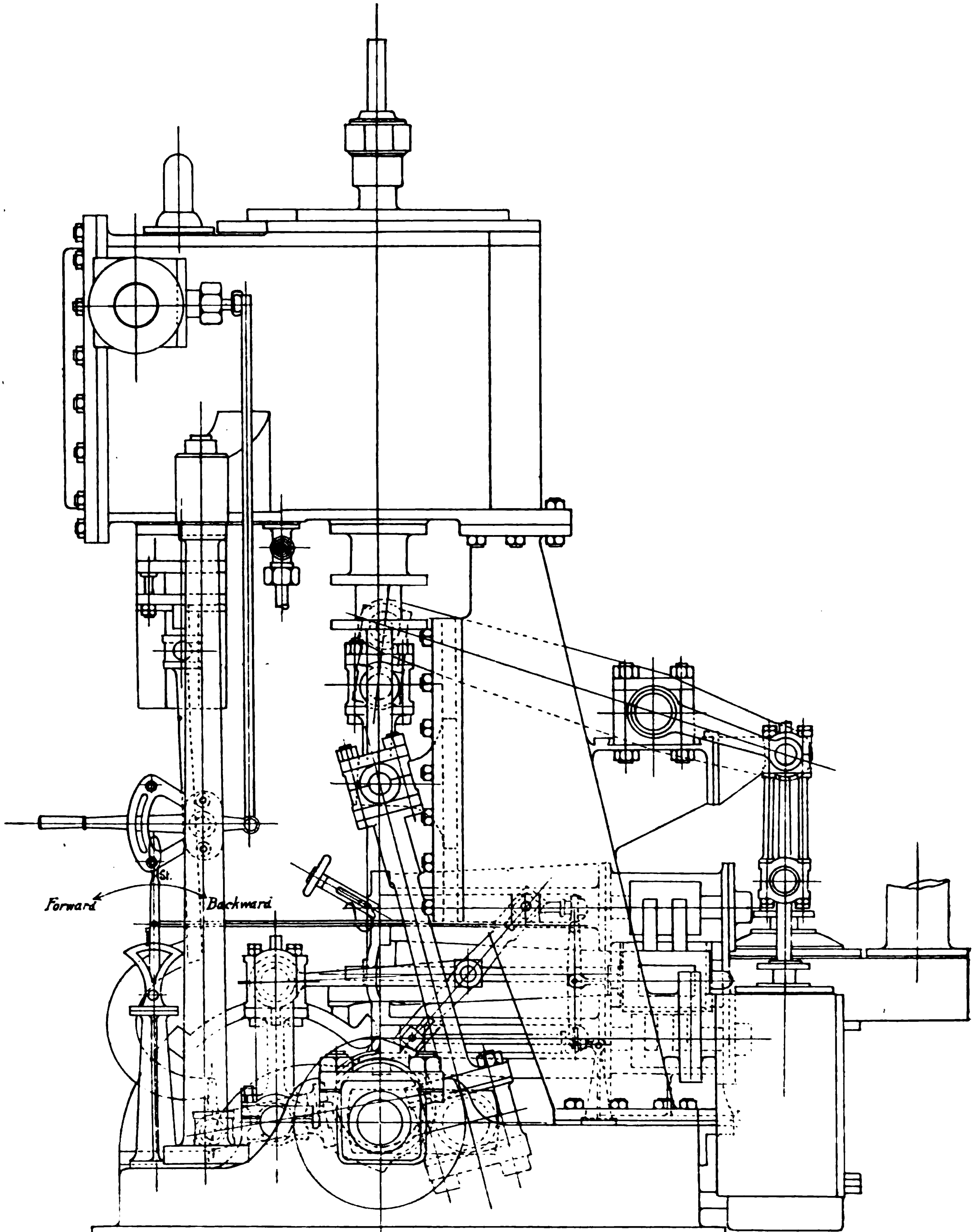


FIG. 2.

BRINKMAN'S REVERSING GEAR.

IN our issue of last month we gave a description and illustration of a new type of gear which is applicable to many purposes, but which, in that instance, was applied to feathering the blades of a propeller, at the same time mention was made that it could be readily applied to engines as a reversing gear. We have now pleasure in illustrating such an application in the adjoining diagram. It will be seen that the valve gear of the engine is of the Marshall


St.
Forward
Backward

Brinkman's Reversing Gear.

type, and that the crosshead of the reversing gear is arranged to rock the arm which carries the bridle-rod controlling the motion given by excentric rod to the valve rod. As was previously explained, this gear gives three definite positions, viz., two end positions and a centre position, by the operation of a single lever to a definite position. It is obvious that this arrangement is equally applicable to the ordinary link motion.

The London agents for this gear are Messrs. Wallace & Co., of 9, Gracechurch Street, E.C.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The Duke of York.

THE Duke of York is once again afloat on active service, and left Portsmouth in the *Crescent* for a preliminary cruise. It is six years since he was in command of the *Melampus* at the time of the Naval Manœuvres of 1892, although this is the first time that he has hoisted his pennant since his promotion to captain's rank in January, 1893. His first command was the torpedo boat No. 39, during the Manœuvres in 1887. He was next appointed to the command of the *Thrush* in 1890, during which time he saw service on the North America and West India Station, gaining a reputation as a smart naval officer. His next command will probably be a battleship. The Duke has thoroughly and completely tested a naval life, and has risen from grade to grade, after considerable experience in each. That he feels an abiding interest in the profession which he has adopted goes without saying.

Some Incidents of his Career.

Naturally enough, "full and complete accounts" of his naval career have been published in all the papers, accounts which contain many anecdotes relating to incidents which happened during his naval career. One of them is an old friend which will bear telling again. The anecdote was originally related by Sir Frederick Bedford, and concerns the Duke when he was serving in the Mediterranean as a lieutenant. A Turkish Pasha having been informed that the Prince was on board the warship, wished to pay his respects to him. On his arrival he was received with all due honour, and explained his mission. Judge of his surprise when the Duke was pointed out to him with his hands and face as black as a sweep's and wearing an old uniform in which he was superintending the coaling operations. Another incident related is of the occasion when he preferred remaining on duty in his torpedo-boat in rough weather in preference to enjoying himself at Goodwood, where his father, the Prince of Wales, was expecting him. If the Duke has a kindly feeling for the naval service, this feeling is heartily reciprocated by all ranks. The *Crescent* has undergone considerable alteration for the accommodation of the Duke. The after-part of the ship has been completely housed in, and was visited by the Prince and Princess of Wales, prior to her departure on her cruise.

The Naval Manœuvres.

Considerable stir has been made in naval circles by the announcement made by the Admiralty to the effect that no mobilisation of the fleet is to take place this year. The text of the official announcement is as follows:—"The customary partial mobilisation of the Fleet will not take place this year, but cruises will be arranged for the Channel and Reserved Squadrons during the summer." Although the coal difficulty is said to have nothing at all to do with this decision, the statement must be taken *cum grano salis*. But even in this case the Admiralty show a certain degree of wisdom. Good steam coal is undoubtedly dearer at present owing to the strike in Wales, and as soon as the Admiralty made a call for coal the price would immediately rise still higher. To say that there will be no Naval Manœuvres is not exactly correct. The statement made by the Admiralty simply means that we revert to the sort of manœuvres which were carried out before 1885. The Channel and Reserve Squadrons will both engage in manœuvres, but these will not be on such an extensive scale as in former years. On this account the torpedo-boat destroyers, *Desperate*, *Mallard*, *Janus*, *Spitfire*, *Porcupine*, and *Swordfish* are now on a cruise in the North Sea from which they return on the 7th inst. They are under the orders of Commander Robeck of the *Desperate*, and are to run instructional cruises between Dover and Harwich.

The Reason of the Decision.

When the announcement was first made it was conjectured that something serious had happened or was going to happen. The statement, too, of someone at the Admiralty, to the effect that the decision was certainly not due to the dispute in the Welsh coal trade, did not serve to allay anxiety. According to the *Times*, all the arrangements for the mobilisation were in active progress when the general's signal was made annulling the annual custom. The dockyard officials regard the decision of the Admiralty as the outcome of the continued dispute in the Welsh coal trade. At Portsmouth there is said to be no scarcity of coal in hand, for there were fully 20,000 tons ready for use some weeks after the strike commenced. Colliers have not arrived from Cardiff as frequently as could be desired, so that it seems doubtful whether the standing order of the Admiralty that the stock should never get below a three-months issue has been complied with. Although there will be no evolutions in the Channel Squadron, no time is being lost in coaling. The *Majestic* and *Prince George* have completed their annual docking, and have now filled up with coal, and the *Mars* and *Resolution* will shortly follow suit. At Devonport the stock of coal has been husbanded wherever possible, being only used when absolutely necessary, ordinary north country coal being used for ordinary purposes. In short, economical reasons seemed to have influenced the Admiralty decision as much as any, for the best Welsh steam coal is about 100 per cent. higher now than in normal times, and any sudden demand for a great quantity of it would perhaps force the price up another 100 per cent.

Chatham Dockyard.

There is no lack of work at this yard. Indeed, if anything, there is too much. Orders have been received from the Admiralty to hasten forward the construction of the *Irresistible* as much as possible, and an effort will be made to launch her at the end of the year, or at any rate, early in '99. The *Irresistible* has about 700 men at work upon her, the majority on overtime. £446,115 is provided for in this year's estimates to be spent upon her in labour and material, exclusive of guns and machinery. Her estimated cost is £60,000. The *Pioneer* is also forging ahead, and it is only a matter of weeks now before she is ready for floating out. The steam trials of the *Vindictive* are to be carried out shortly. There are seven vessels in hand here now undergoing repair, in addition to many of the ships of the Channel Squadron and Instructional Flotilla. £40,000 is to be spent on the *Dreadnought*, £8,000 on the *Ajax*, about £12,000 on the *Warspite*, £18,000 on the *Brisk*, £10,000 each on the *Superb* and *Edinburgh*, and £5,000 on the *Dryad*. The *Isis* is to take the place of the *Blenheim* in the eastern division of the Channel Squadron. The *Blenheim*, whenever she once again hoists the pennant, will be engaged in taking out a new crew for the *Barfleur* on the China Station. The repairing of the damage which the *Illustrious* sustained through striking the side of the basin was accomplished in the most rapid manner, men working day and night upon her. It was at first thought that one of her propeller blades had been bent, but on investigation the damage was found to be much more serious. One of the propeller blades had been broken, and two others badly bent. Only four days were taken up in fitting her with new ones. It has finally been decided to lengthen the building slips at this yard, and when the Comptroller of the Navy was here a short time ago, he made an inspection of them with this in view.

Oil Fuel for the Navy.

The trials which have been made with oil fuel on the destroyer *Surly*, have not been altogether a success, although the exact cause of this partial failure is not yet known. These experiments have been in contemplation for some time, but have been delayed on account of the opposition experienced, and also on chemical grounds. It was said that on those ships where the oil was used uncleanliness was certain to result, also that it would be impossible to get rid of the smell of the oil by fumigation or any other means. Then again there was the danger of explosion. It now appears that many of these difficulties have been overcome, The oil is reduced to the consistency of thin printers' ink, and its explosive force considerably reduced. While the *Surly* was carrying out the trials nothing but a thin white film came through the funnels, and it appears that by its use the stokehole is kept cool, and that labour is economised. Should the experiments prove entirely successful, and it is determined to substitute oil for coal in the ships of the future, it would mean that the present machinery in warships would have to be considerably altered. The Admiralty are not enthusiastic over the scheme, and if Russia is to be our main source of supply, there is good cause for this lack of enthusiassm.

Admiralty Surveyors for 1897.

A parliamentary paper has just been issued containing the report of the Hydrographer of the Navy of the Admiralty surveys for 1897. From this we learn that 11 vessels altogether were engaged on the work, 4 in home waters, and 7 in foreign waters. Seventy-five officers have been employed, including 50 surveying officers and men to the number of 639. The amount of work which has been done is considered most satisfactory. Report points out that notwithstanding the progress of hydrography and the constant employment of our own and foreign surveying vessels in all parts of the world, the requirements of modern navigation increase more rapidly than the advance of surveys. The number of newly discovered rocks shows no sign of diminishing. 190 rocks and shoals dangerous to navigation were discovered during 1896, and these were notified to the public by notices to mariners. The report describes the whole of the work done in detail, and in addition gives some notes on the Indian marine surveys carried on during 1897.

More about the "Terrible."

The failure of the *Terrible*, and her sister ship the *Powerful* to come up to the high standard which her designers expected of her, has resulted in a court of enquiry being convened to investigate the whole subject. Some are inclined to believe that the defects are matters which can be easily remedied. The trouble is with the engines only, caused by the friction and heating of certain parts. As a remedy, keeping the ships in commission is advocated, this being likely to result in the gradually wearing smooth of the rough parts by frequent use. The failure of the *Terrible* to maintain her reputation while Mr. Goschen was on his trip to Gibraltar in her, is said to have caused him to give expression to his annoyance at the occurrence. Her machinery is to be opened up at Portsmouth, and an effort will be made to discover the cause of her breakdown, and a complete list of any defects discovered forwarded to the Admiralty. It is wrong to ascribe the failure to the boilers, despite what is said by such critics as Mr. Allan, M.P. They have proved an unqualified success, and this is well known by the Admiralty. Both the *Powerful* and *Terrible* have now been at sea long enough to set at rest all doubts as to their steaming powers.

Damaged Destroyers.

The torpedo boat destroyer *Thrasher* has at length recovered from the injuries she sustained off Dodman's point on the Cornish coast last year, but, like a man who has been injured and undergone a severe operation in order to assist in his recovery, she seems destined to feel the after-effects. The result of a steam trial in the Channel would seem to show that one result of the knocking about she received is that she has lost over four knots in speed. On a contractor's trial she maintained a mean speed of 30·3 knots, but now she can hardly make 26 knots. The mean results of the trial in question were:—Steam in boilers, 198 lbs.; steam at engines, 188 lbs.; vacuum starboard, 24·3 in.; port, 23·3 in.; revolutions starboard, 304; port, 304·8; I.H.P. starboard, 2,717; port, 2,783; (total, 5,500); air pressure, 2·78 in.; speed, 24·3 knots. Something like £5,000 has been spent in setting her to rights and her guns have been practically remounted, and have since undergone satisfactory tests. The torpedo-boat destroyer *Osprey* has also been in trouble. When leaving the basin at Greenock, on her way to Devonport, she ran against the wall with the result that two of the port's propeller blades were considerably bent, but on investigation it was found that the vessel had not been damaged below the water line, and she was therefore able to proceed to Plymouth. Her trials have been postponed until she has been docked.

Devonport Dockyard.

At this yard they are building the *Ocean* and the *Psyche* which will be launched on July 19th. As regards the first-named, some anxiety is expressed on account of her great weight at launching, which will be nearly 8,000 tons. She is to take the water on the 5th, when the Lords of the Admiralty will be present. Stoker Lynch, the hero of the *Thrasher* disaster, is laid up at the Naval Hospital, one of the after-effects of that event, and it is likely that he will be invalided out of the service. If this should be the case, it is certain that there will be plenty of openings for him. The *Niobe* and her sister ship the *Europa*, one of them built at Glasgow, and the other at Barrow-in-Furness, were lying abreast of each other inside the breakwater recently, and the fine appearance of the two ships caused the representatives of their respective contractors to mutually congratulate each other upon the appearance of them. It was with a good deal of regret that Rear-Admiral J. Fellows' command of the Western Division of the Channel Squadron came to an end. The farewell dinner on the *Magnificent* was a demonstration of feeling which showed the esteem in which he was held by every one. His place will be taken by Rear-Admiral J. W. Brackenbury.

New Cruisers.

The contractors for the four first-class armoured cruisers, provision for which was made in the Navy Estimates of the current financial year, have now been given out. They are to be named, the *Hogue*, *Cressy*, *Aboukir*, and *Sutlej*. The first-named will be built by Messrs, Vickers, Sons & Maxim, at Barrow-in-Furness, and will be sent round to Devonport when in a sufficiently advanced stage for her completion. The Fairfield Ship Building Co., of Glasgow, have secured the contracts for completing the *Cressy* and *Aboukir*, which are to be finished at Portsmouth. The *Sutlej* will be built at the yard of the Clydebank Shipbuilding Co., Glasgow, and is to be sent to Chatham to be completed. Three officials from the Devonport Dockyard have been appointed to oversee the building of the cruisers, and a representative from Keyham is to be sent to Barrow-in-Furness to oversee the manufacture of engines and boilers for the cruiser which is to be built there.

The Trials of the "Niobe" and the "Europa."

The *Niobe* has at length concluded her trials, with the exception of her gun, torpedo and sepent trials, which will probably take place early this month. Her 30 hours' coal consumption trial was in all respects satisfactory, although she did not finish as soon as was expected owing to fog. Her eight hours' full-power trial was also very satisfactory. The total I.H.P. was 16,834, which was 334 in excess of the contract. Her coal consumption was 1·66 lbs. per I.H.P. per hour. and speed 20·5 knots. The new cruiser *Europa* is also going through her trials in a manner highly satisfactory to all concerned, as did her sister ship, the *Diadem*, on the 10th of last month. She started out to steam for 30 hours at 12,500 H.P. At the completion of the run the next evening the best consecutive 24 hours showed the following results:—Draught of water forward, 24 ft. 6 in.; aft, 26 ft. 6 in.; steam in boilers, 265 lbs.; vacuum, 24 ft. 8 in. starboard, and 25 ft. 5 in. port; revolutions, 103·8; H.P., 12,739; coal consumption, 1·94 lbs. per I.H.P. per hour. During the trial she had four runs over the 23 miles deep-sea course between Rame Head and Dodman Point, and the results showed that with 12,441 H.P. and 103·6 revolutions she maintained a main speed of 19,331 knots. Her eight hours' full-power trial included two runs over the deep sea course off the Cornish coast. She had 279 lbs. of steam in boilers, and with 113 revolutions, and 17,137 H P. she made a speed of 20·4 knots. The mean of the eight hours was 17,010 H.P. At her extra trials she was required to steam for four hours with 70 per cent. of her boiler power in use, and she developed 16,298 H.P., while the speed, taken over a 24-knot measured course was 20·8. She had 280 lbs. of steam in the boilers, and the engines gave 110·3 revolutions. Altogether her trials were considered highly satisfactory.

The Launch of the "Highflyer" and "Albion."

Early last month the new second-class cruiser *Highflyer* was launched from the yard of the Fairfield Shipbuilding Co., Glasgow, and the launch was in every way a success. The new cruiser is practically an improved *Juno*. She is of 5,600 tons displacement, and has been specially constructed with a view to long foreign cruises. Her engines are of 10,000 H.P., and she will have a speed of 20 knots. She is fitted with Belleville boilers and two sets of triple-expansion engines. She is 350 ft. long by 54 ft. wide, with a powerful ram. The *Highflyer* is built throughout with Siemen's steel, and has a cellular bottom which extends over the full length of the engine-room and boilers. She is armed with 11 6-in. guns, eight 12-pounders, with Maxims and submarine torpedo tubes, with a bilge keel to secure steadiness in firing. The new battleship *Albion* was launched from the yard of the Thames Ironworks Co. at Blackwall on the 21st ult. The *Albion* is one of the five ships of the *Canopus* class, and the slip which she vacates is that upon which the *Vulcan* was built 50 years ago. The *Albion* is 390 ft. in length, 74 ft. in breadth, draught 26 ft., and displaces a load water line of 13,000 tons. She is said to be an improvement on the *Majestic*. She is protected by a belt of 6 in. Harveyed steel, 195 ft. in length, which extends 9 ft. above the water line to 5 ft. below it. Her two barbettes forward and aft, are protected by 12 in. armour on the upper tier of plates, and 6 in. on the lower, and her two conning towers, one forward and one aft, are protected by 12 in. and 3 in. nickel steel armour respectively. Her decks are protected by Harveyed steel 8 in. thick, 126 in. quick-firing guns, 10 12-pounder, six 4-pounder Hotchkiss, with some smaller guns. She will also carry 19 torpedoes—14 8-in. and five 14 in. The point of her ram will only be about 7 ft. under water. Her machinery, built by Messrs. Maudslay, Sons & Field, will consist of two independent sets of 3-cylinder inverted triple-expansion engines. Belleville boilers are to be supplied, of which there will be 20 in three watertight compartments. The *Albion* will carry 1,900 tons of coals. The Duchess of York performed the christening ceremony. Her future progress will be reported from time to time in these columns. In connection with the launch of the *Ocean*, which is fixed for the 5th of this month, it is interesting to note that instructions have been given that no more heavy material be placed on board before she is launched. Her launch weight was originally to have been 8,000 tons, which would have given her the record in this direction. Three ships are to be launched from the Elswick yard early this month.

The Calamity at the Albion's Launch.

The terrible disaster which happened at the launch of the *Albion* is, of course, in everybody's mouth at the present moment. As regards the actual launch everything went off smoothly, the vessel taking the water without the slightest hitch. Three incidents, which are pointed out as bad omens, occurred before she entered the water. First of all we are told that the lunch was eaten and success drank to her before she had left the slip, next, that although the Duchess of York tried three times to break the customary bottle of wine over her bows when naming her she failed to do so, and the vessel was launched without being christened. It was also stated that the bottle contained rosewater, in deference to Mr. Hill's temperance principles, instead of wine, which, as a sailor expressed it "was enough to d—— any ship." Sailors are more superstitious than landsmen, but these are certainly curious incidents. The disaster, it appears, was due to a bridge, which was used as a gangway by workmen, being swept away by the backwash caused by the displacement of water by the vessel being launched, and to an insufficient force of police being present to prevent people crowding on this gangway, on which notices were up saying that it was not safe for a number of people to congregate on it. The disaster will bring to mind that which occurred at the launch of the *Daphne* on the Clyde, in July, 1883, when 124 people met their death. The Duke and Duchess of York have expressed their sorrow at the occurrence, and their sympathy with the relatives of those killed.

Portsmouth Dockyard.

The most important happenings at this dockyard during the past month have been the commissioning of the *Crescent* by His Royal Highness the Duke of York, and the visit of the parliamentary party to the yard. The duration of the Duke's command is not known, but it is expected that he will be at Cowes in the *Crescent* during the regatta week, and there is some talk of his visiting Copenhagen afterwards. The visit of the members of the House of Commons to the yard was chosen at a good time, as there are just now quite a number of battleships built and building here. The *Canopus* and *Formidable* are building, and the *Terrible* is in dock. The *Gladiator*, *Seagull*, *Barham*, *Bellona* and others also lie in their basins. The torpedo and gunnery schools interested the visitors as much as anything. Many ships were in hand here preparing for the Manœuvres, and the *St. George* was having a new shafting put in, but on account of her being required on the 28th ult. the old shafting had to be replaced. The yard still continues to feel the effects of the dispute in the engineering trade. The *Canopus*, for instance, was to have been ready for commission in twenty months, but a good deal of extra work will be required on her if she is ready in thirty months. The *Gladiator* too, should have been in the Fleet Reserve by this time, and yet her steam trials will not take place before October next. The *Pandora* makes fair progress and up to the present, 600 tons have been built into her. The *Formidable* has had nearly 2,000 tons built into her. The *Seagull*, *Barham* and *Bellona* have practically finished their refitting, and the *Marathon*, *St. George* and *Orlando* have also got over their troubles.

Mr. Rudyard Kipling and the Navy.

Mr. Rudyard Kipling bids fair to become as noted for verses connected with the Navy as he is with those he has written about the Army. In the *Windsor Magazine* for June there is a poem entitled, "The Destroyers," accompanied by some excellent illustrations by C. J. De Lacey. Both verses and pictures are of a vigorous nature, as the following verses will show:—

> "Now, while their silly smoke hangs thick,
>   Now, ere their wits they find,
> Lay in and lance them to the quick—
>   Our gallied whales are blind.
> Good luck to those that see the end,
>   Good-bye to those that drown—
> For each his chance as chance shall send—
>   And God for all! Shut down.
>
> "The strength of twice three thousand horse
>   That serve the one command;
> The hand that heaves the headlong force,
>   The hate that backs the hand;
> The doom-bolt in the darkness freed—
>   The mine that splits the main—
> The white-hot wake, the 'wildering speed—
>   The Choosers of the Slain!"

Mr. Kipling got his experience in a cruise in the torpedo-boat destroyer *Foam*, and he also quotes from Mr. Armstrong's "Torpedoes and Torpedo Vessels" some lines as a text for his poem. Mr. Armstrong's book, which is one of that invaluable series, "The Naval Hand-Books," is now regarded as a standard work upon the subject it deals with.

The Naval Engineer Students' Examination.

The open competition held in April for naval engineer students shows that there were 162 candidates for 26 vacancies at Keyham College. In spite of the fact that the competition was a very stiff one, 60 other candidates, in addition to the successful 26, obtained qualifying marks; 39 failed to qualify in one or more of the obligatory subjects. The examinations were held at London, Birmingham, Manchester, Newcastle, Devonport, and Portsmouth. Of the 26 successful candidates, seven were prepared at the Devonport High School, including the one that takes the first place in all England. This honour belongs to George Bedford, a son of Mr. G. Bedford, of Rock View, Torquay. The following are the candidates from the Devonport High School, and their respective positions out of a maximum of 1,950 marks:—1st, George Bedford, 1,606 marks; 3rd, James Budge, 1,471; 11th, George Odam, 1,384; 13th, William Philip May, 1,354; 19th, Allan Rosevere, 1,323; 20th, Cecil Dallas, 1,315; 24th, Stanley Smith, 1,299. The 27th lad is Frank Carlisle, with 1,258 marks. He was also prepared at the Devonport High School, and in the event of either of the successful candidates failing to pass the medical examination, will be admitted to the College.

Hispano-American War.

The Hispano-American war drags on and does not seem to excite more interest than did Barnum's show at the end of its stay in London. At first each morning paper devoted the whole of its telegraphic news to "full accounts of the war," but now the war is relegated to a secondary place, and law cases and Old Bailey trials once again hold sway. The Spanish position in the Philippines is desperate, for, according to the papers, the rebels are besieging the capital, and with Aguinaldo behind, and Dewey in front, the Spanish would seem to stand a bad chance of extricating themselves from their difficulties. Admiral Montij has had an interview with a special correspondent of the *Times* on the subject of his defeat, and in the interview blames the Spanish Home Government for not sending him supplies of gun and marines which had been promised. In Cuba, the fall of Santiago, and the capture of the fleet in the harbour, will be the next move in the game. The Americans have blocked up the Spanish fleet by sinking a collier at the entrance to the harbour, and are rapidly throwing troops into the island. Altogether, the Spanish Government seems to be paralysed at the course of events. The Reserve Fleet leaves Spain daily, only to return. Rumours, too, are current, that the Spanish Government is seeking the intercession of some of the European Powers, but whether their efforts in this direction will prevent their losing the Philippines, Cuba, Porto Rico, &c., is extremely doubtful.

Pembroke Dockyard.

The *Andromeda*, *Spartiate*, and the Royal yacht all continue to make satisfactory progress. All three vessels were recently inspected by Sir William White, the Director of Naval Construction, who appeared satisfied with the progress made. The phosphor-bronze stem has been lifted into position together with a shield and crown to form a figure head above it. The Royal yacht is undoubtedly in a forward condition considering the number of men at work on her. The phosphor-bronze stem of the Royal yacht, which weighs 10 tons, involved a considerable delay in other work upon her. The framework of nearly her whole length is in place. The plating of the outer bottom, and sides, we are told, for about two-thirds of her length, right up to the upper deck, is also in place, and has been rivetted. An effort will be made to have the *Andromeda* leave here in the middle of August, to be completed at Portsmouth, although it is expected that much overtime will be resorted to in order to advance the ship to the stage desired. The *Spartiate* is well advanced, but there is need also of a great deal of overtime on her, and much remains to be done before she can be launched. The present staff of the yard is quite insufficient for the amount of work in hand, unless overtime is resorted to pretty much. It is expected that the next vessels which are laid down here will both be battleships, or at least, one battleship and a large cruiser.

Sheerness Dockyard.

Nothing very startling has happened at this yard during the past month. Everything is ready for the trials of the *Proserpine* which, it is expected, will not last longer than ten days. After the preliminary test, she will undergo a 30-hours trial in order to get her machinery in working order before she undergoes her natural and forced draught trials. The *Proserpine* is the first vessel engined at this yard, fitted with water-tube boilers which were made in the steam factory at Keyham, and are of the Thorneycroft type.

The refitting of the gun boat *Landrail* has been completed, and she is now quite ready to resume her duties. The *Spitfire* torpedo-boat destroyer is to take the place of the *Snapper* in the destroyer flotilla, which recently returned from their cruise to Scotland. The *Snapper* will undergo an extensive refitting. Good progress continues to be made on the *Condor* and *Rosario* slips, and it is expected that they will be ready for launching about the commencement of December. When these vessels are launched two more ships are to be laid down in their place, and these are to be built, it is thought, upon similar lines to the *Condor* and *Rosario*. The trials of the torpedo boat *Angler*, which was recently delivered from the yard, have given much satisfaction to Messrs. Thorneycroft. At a three hours' trial she developed 5,977 I.H.P., whereas the designs only called for 5,400 H.P. The former was developed with a pressure of 202 lbs. of steam, the engines working 399·6 revolutions per minute. Her speed was 30·409 knots per hour.

A SINGULAR accident occurred in Portsmouth dockyard on Wednesday, June 22nd. Three large trolleys, piled with bags of rivets were being propelled by a locomotive, and when the train reached the entrance to the steam basin the driver noticed that the caisson had been removed. He stopped the engine, but the suddenness of his action caused the coupling of the near trolley to snap, and the trolley rolled over into the entrance to the basin. As the bags of rivets choked the groove in which the caisson slides, four divers were sent down to remove them in the hope of replacing the caisson before ebb tide. As, however, the task could not be accomplished in so short a time, the cruiser *Orlando*, which was lying in the steam basin, was removed to prevent her from grounding at low water.

WATER TUBE BOILERS.*

BY MR. G. HALLIDAY, WH., Sch., AND MR. EDWARD SEABURY (MEMBERS).

CHAIRMAN: ALDERMAN G. W. KIDD.

THERE was a very large attendance, and the discussion was animated. The paper was read by Mr. Halliday.

At the beginning, in the days of Savery, Smeeton, Newcomen and Watt, boilers were simply closed pots containing water, which was to be converted into steam at about atmospheric pressure. As higher pressures were soon in demand, engineers had of necessity to modify the design to withstand these pressures. After the design had been adapted to the pressures, Watt at once began to arrange for fuel economy and high efficiency. For present-day marine engineers, lightness and rapidity of evaporation are the *alpha* and *omega* of boiler design. For a long time the struggle for the first place has been going on between makers of the cylindrical type and the water-tube boiler.

Mr. Goschen, First Lord of the Admiralty, announced the other day, in the House of Commons, that all expert evidence was now wholly in favour of the water-tube type. If there were nothing else, the mere fact that a few years ago the weight of boiler with water in it to give an I.H.P. was 200 lbs. as against 23 lbs. with an express boiler of the present day, points to the adoption of the water-tube boiler in the near future.

The behaviour of the plate which transmits the heat from the flame to the water is now of great interest, and especially so where the transmission is forced. But little was known of the temperatures of the sides of the plate even, until Mr. A. C. Kirk and Sir John Durston made experiments to ascertain the facts.

The method adopted by both to obtain temperatures was the same, namely, by means of fusible plugs inserted in the bottom of the vessels with which the experiments were made. It was assumed that the temperature of the metal on the water side was the same as the temperature of the water. Sir John made some of his experiments with an open dish, 10 in. diameter, 3 in. deep, and $\frac{1}{4}$ in. thick. He placed this dish containing water over a flame at a temperature of 1,500 deg. F. Fusible pieces of solder ranging in melting point from 220 deg. to 250 deg. F. were fixed on the bottom. With these he ascertained the temperature to be 240 deg. F. The water was open to the atmosphere, and was at a temperature of 212 deg. A layer of grease obtained from the interior of a ship's boiler was put on the inside bottom of the vessel, $\frac{1}{32}$nd of an inch thick, and this caused the temperature of the bottom of the vessel next the fire to rise to 330 deg. F.

A flanged plate with a tube expanded into it showed a temperature at the middle of its thickness between 290 deg. F. and 336 deg. F., the temperature of the fire being about 2,000 deg. F. With a vessel of flat ends and through tubes of steel, brass, and iron, placed vertically on a fire so that the tube plate was subject to a heat of about 1,400 F. and the pressure of steam inside the vessel 100 lbs., it was found after being overheated and then allowed to cool, that the tubes leaked so badly that no pressure could be obtained; no difference was observed in the behaviour of the tubes. The same experiment was made with lead plugs inserted in the plate, and as soon as the plugs—with a melting point of 617 deg. F.—had melted, the vessel was taken from the fire and tested to 200 lbs. pressure, and found to be quite tight. A similar result was obtained after fusing some plugs of zinc, with a melting point of 770 deg. F. It was concluded that up to a temperature of 770 deg. F. no damage was done to the boiler. It was further found by a series of experiments that the loss of efficiency of transmission in an iron tube due to a thin coating of grease was 11 per cent. With an open dish partly filled with fresh water and placed horizontally over a fire urged by a moderate blast, the temperature of the plates was 240 deg. F.; with a higher blast the temperature rose to 280 deg. F. These experiments show very clearly the very bad effect of a thin coating of grease. When the surfaces of the plate were practically clean the difference in temperature between the water side and the fire side of the plate, did not exceed 100 deg. F. even with high steam pressures, whilst the addition of 5 per cent. of linseed oil raised the difference to about 30 deg. F., and a greasy deposit of about 1-16th in.

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* Read at the Institute of Marine Engineers at 58, Romford Road, Stratford.

thick made the temperature on the fire side of the plate rise to about 300 deg. F. above the temperature of the water side, the temperature of the fire varying from about 2,300 deg. F. to 2,500 deg. F. Variations in the pressure did not alter the relative temperatures of the two sides of the plate. In this connection marine engineers will have experienced the great difficulty of keeping the back tube plates of marine boilers in a good condition even with ordinary natural draught, and it is our belief that the very bad tube and tube plate failures experienced in the Navy decided our naval authorities to look to the water-tube type of boiler as a means of avoiding the defects experienced in other types.

Consider now some experiments made by the late Mr. Blechynden to determine the effects of varying differences of temperature and varying thickness of plate.

The apparatus employed by Mr. Blechynden for this purpose is shown on Fig. 1. There is a boiler on the top 10 in. diameter and 12 in. high, made of tinned iron plate about 24 W.G. thick. It is surrounding by a jacket leaving a 1-in. space on sides and top, and this jacket was covered with asbestos fibre 3-8ths in. in thickness to prevent radiation. Steam could be passed through the jacket by the inlet and outlet pipes. The plate subjected to the experiment was soldered into the bottom, and water could be admitted and steam allowed to escape by the openings 4 and 5.

The furnace was beneath; its walls were made of firebrick inside an iron casing; five gas jets, 15, supply the flame, and these play on abestos lumps placed above them to equalise the heat; there is a hole marked 14 and another 13 through which the temperatures can be taken, and 11 and 12 are passages for the escape of the hot gases.

Siemen's-Martin steel was used for the plates, each plate being machined on one side only to make it the required thickness; five plates were used of different carbon values ranging from ·25 to ·21 per cent., and having specified gravities varying 7·742 to 7·84. The results obtained are seen in the table appended:

	Temperature of Furnace.	Difference of Temperature.	Total units of Evaporation.	$\frac{\text{Temp. 2}}{\text{Temp. 1}}$	$\frac{\text{Evap. 2}}{\text{Evap. 1}}$	$\left(\frac{\text{Temp. 2}}{\text{Temp. 1}}\right)^2$
	1 Degrees.	2 Degrees.	3	4	5	6
1	838	626	6·820	1·9	3·97	3·87
2	1,445	1,233	27.100			
1	775	568	6·705	2	4·4	4
2	1,370	1,143	29·550			
1	625	413	4·270	3·0	9·13	9
2	1,465	1,253	38·950			
1	850	638	9·715	1·9	3·64	3·86
2	1,465	1,253	38·950			

Each of these four groups consists of two readings of experiments made with the same plate; the fourth column gives the second reading of temperature divided by the first of each pair, the fifth column gives the evaporation from the plate of the second of each pair divided by the first, and the sixth column gives the square of the second temperature divided by the first. It will be seen that the numbers in the columns five and six are nearly equal, and that the evaporation from the plate is proportional to the difference between the flame and the water squared. This is given graphically in the accompanying curves (Fig. 2) for the different thicknesses of plate. Note the effect of the thickness of the plate on the transmission of heat. Take the difference of temperatures 1,500 transmits a 8 3-16ths in. plate for 34,000 thermal units per square foot per hour; while a 1-16th in. plate transmits over 56,000 thermal units in the same time.

It was found that the machined surface made a difference in the transmitting power of the plate; this was tested by machining one plate on both sides and comparing it with two other plates not machined, the differences were as as ·0148 to ·0225. The following table gives the carbon percentages and gravities of the plates used:—

Carbon.	Specific gravities.
·21	7·8176
·22	7.8032
·23	7·8401
·25	·7420

It was found that the lowest in carbon was also the lowest in

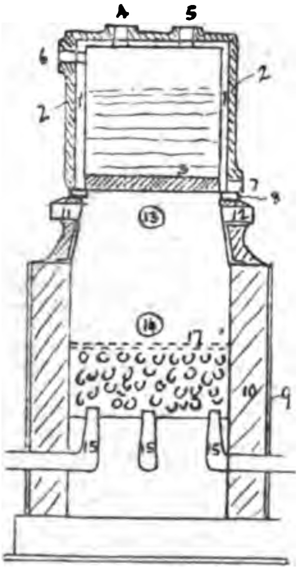

FIG. 1.

conductivity, so that steel plates should have an advantage over iron ones, whilst it was also apparent that the best evaporative results would be obtained by using thin plates and a hot furnace these conditions can, of course, be much more readily obtained and with greater safety in the water-tube boiler than in that of any other type.

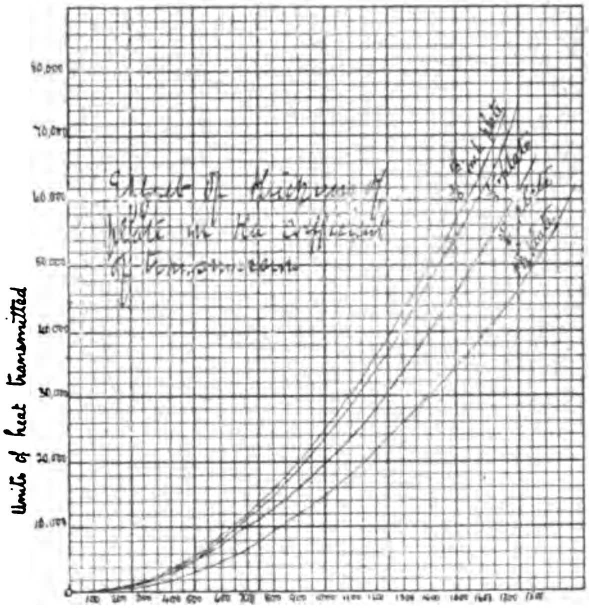

FIG. 2.

Professor Ser, of the College of Arts and Manufactures, Paris, made a series of experiments to determine the influence of rapid motion of water over the heating surface. The apparatus he used consisted of a thin copper tube, a foot in length and 2-5th in. internal diameter. (Fig. 3.) The water was made to enter at the pipe C, pass through the tube A B, and flow out again at D. The temperature of the water to be heated was shown by a thermometer at a, and after heating at b, a casing or muff, M N P Q, made of copper, surrounded the tube A B. Steam was passed through this muff by the connection shown at E, and its temperature was shown by the thermometers n and m. All the surfaces of the casing or muff were covered with wadding to prevent radiation. The principal object which the Professor had in view was to find the transmission co-efficient at different given velocities of water in the tube A B, the temperature of the heating medium being constant, and the results of his experiments are given in the following table. The co-efficient is the number of French calorics transmitted per square mètre per hour.

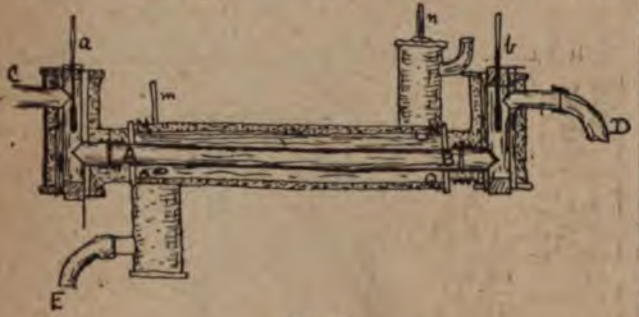

Fig. 3.

Speed of water through the tube in metres per second	Co-efficient	Speed of water through the tube in metres per second	Co-efficient
·1	1,400		
·2	2,230	·7	3,180
·3	2,550	·8	3,330
·4	2,710	·9	3,480
·5	2,860	1·0	3,640
·6	3,020	1·1	3,800

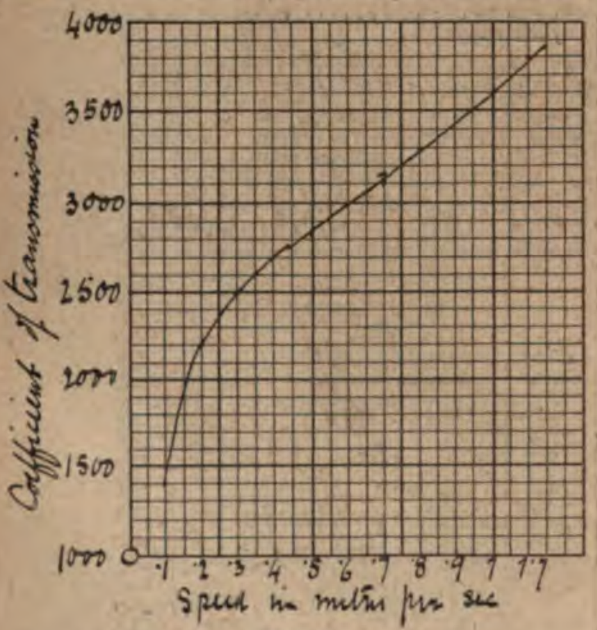

Fig. 4.

From the above tables it will be seen what a great gain of transmission efficiency can be got by increasing the velocity of the water to be heated over the heating surfaces, and the increase is clearly shown by the accompanying curve, Fig. 4, it is seen that the rate of increase of transmission rises very rapidly between the velocities ·1 and ·3 metres per second; from ·3 to 1·1 the transmission of efficiency does not rise so rapidly, still there is a constant rise proportional to the speed. From this part of the curve the co-efficient of transmission Q works out to be

$$Q = 2{,}080 + 156 \times \text{velocity of water.}$$

Here, then, we have a law based on Professor Ser's experiments which proves that the quicker water passes over the heating surfaces the better of the transmission of heat from the heating medium to the water, in other words, the more rapid the circulation of the water over the heating surfaces the greater the evaporation. This is undoubtedly very favourable to water-tube boilers, as it is possible with them to arrange the tubes in such a manner that there is little or no obstruction to the circulation of the water in them, a condition not attainable in the old marine type. If you will consider, the construction of this latter boiler immediately over the furnaces is filled with tubes more or less closely pitched; now, as the greater part of the evaporation in proportion to the surface takes place on the furnaces, it follows that the circulation there is in this type of boiler is not all that could be desired, as it is so difficult for the stream of water and steam bubbles to ascend to the surface when obstructed by the tubes immediately over the furnace. Imagine a ball, say, of india-rubber, to be substituted for a steam bubble, and to be driven by any mechanical force from the surface to the water level, striking first against one tube and then the other; it will at once be apparent to us that the tubes in the Scotch boiler must have a retarding effect of considerable amount on the escaping steam bubble formed on the furnaces.

Having now looked at what takes place on the steam and water side of a boiler, let us consider the fire side.

There is practically no limit to the size of firegrate we may employ, and we are not troubled with either the Board of Trade or Lloyd's rules for plain or corrugated flues, whilst the space necessary in all boilers for the combustion of the gases is in the watertube boiler easy to arrange. We can also avoid the cooling effect that a large flat-sided combustion chamber has on the gases, being able to split them up into currents of flame, without partly extinguishing them. The circulation which we have seen is so very necessary in the case of the water is just as important for the flames on the fire side if good results are to be obtained.

Before turning to the boilers which we have the pleasure of bringing before your notice, may we point out one or two features which go to the sum of a good marine boiler. Of course the first consideration is that the materials used, and the construction not only of the boiler proper but of all its fittings and connections, must be such that there is no risk of explosion or failure under any conditions that can obtain in ordinary working. Next, the heating surfaces must be so arranged and of such area that as little as possible of the heat produced on the fire side is lost, and the water to be evaporated should be split up into comparatively small sections and guided as easily as possible through the hot gases, the form of tubes being such that little or no obstruction is offered to the free escape of the steam produced. The boiler and all its parts should be readily accessible for cleaning and repairs, and the parts liable to most wear should be so designed that replace ones can be obtained in any part of the globe to which the ship is likely to go.

Turning now to the boilers which have been selected as types, the illustrations and results of trials have been obtained from the makers themselves or from the published results in the engineering papers.

Take first the Babcock & Wilcox boiler (Fig. 5). This firm have made hundreds of their boilers for land purposes and fitted some to a number of American steamers, and latterly to other ships, both English and foreign. The illustration will explain the construction and arrangement of this boiler. The makers claim the following advantages over other types of water-tube boilers: The tubes are all straight, therefore easy to clean or replace; no screwed joints are used to fix them, they are expanded into the headers with an ordinary expander; the steam and water collector or drum is of such ample dimensions as to ensure perfect steadiness of water level and dry steam; the circulation is continuous and no overheating of tubes can take place.

A boiler of this type was fitted some few years ago into Messrs. T. Wilson's *Nero*, and we believe gives satisfaction, but we have no results of its working.

A very complete set of tests have lately been made with one

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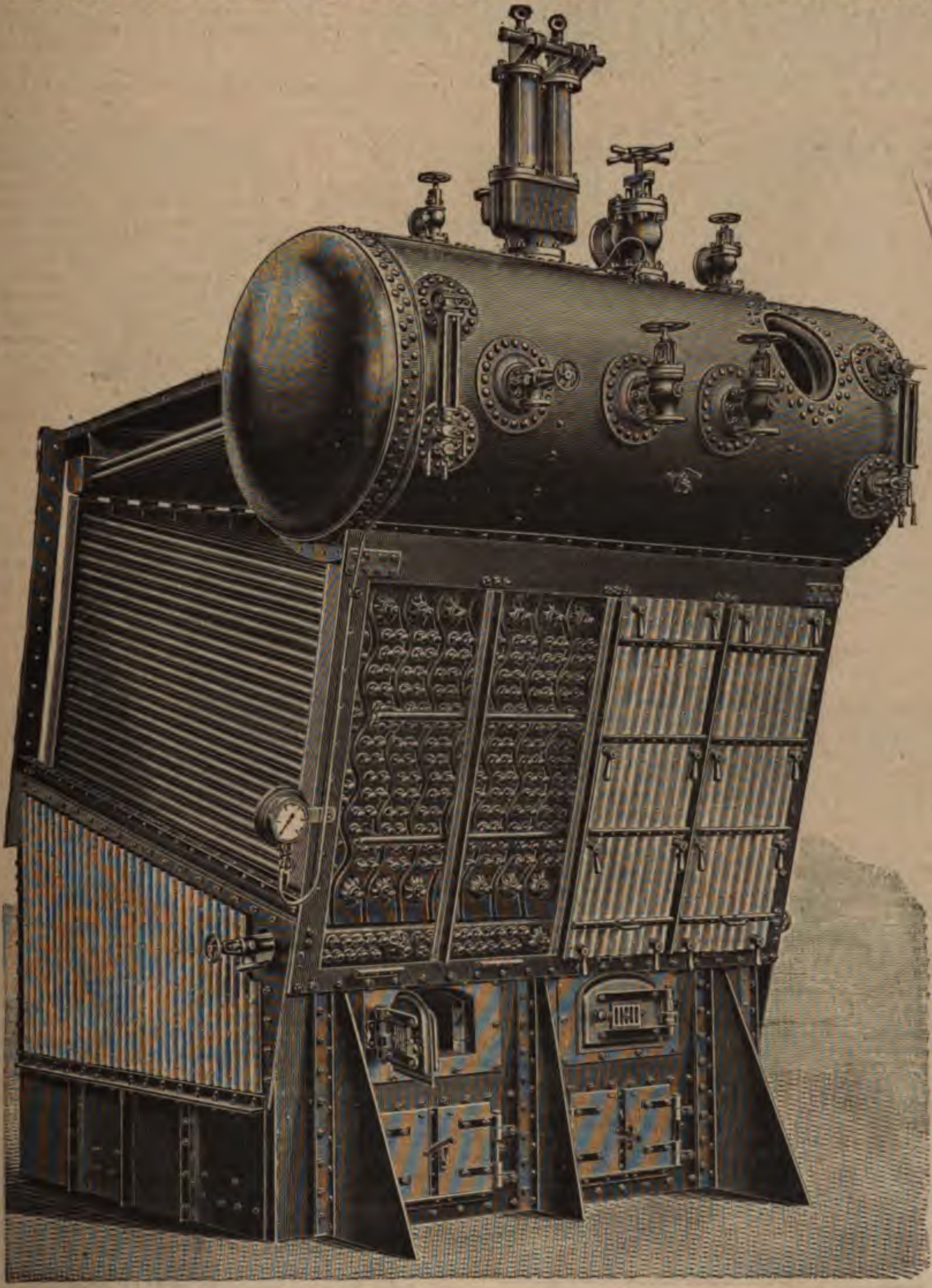


(Fig. 5.)

of these boilers of an improved type, for H.M.S. *Sheldrake*, before it was fitted on board.

With a combustion of 40 lbs. of coal per square foot of grate, the evaporation was 8·3 lbs. of water per square foot of heating surface, and the evaporation was 9·15 lbs. of water from and at 212 deg. F., per pound of coal burnt; the draught was equal to one-half inch column of water, and was produced by a steam jet. The rate of combustion seems high with such a draught.

On the efficiency trials with the same boiler burning Powell Duffry steam coals, the rate of combustion being 26 lbs. of coal per square foot of grate, the evaporation per square foot of heating surface was 6·35 lbs. and the evaporation per pound of coal was 10·9 lbs. of water from and at 212 deg. F., the funnel temperature being 600 deg. and the boiler efficiency 73 per cent. Some further trials at a slower rate of combustion increased the boiler efficiency to 80 per cent.

Messrs. Hornsby & Sons, of Grantham, make a somewhat similar boiler, which, although it has never been fitted for marine purposes has a good reputation at electric light stations and elsewhere. Its construction is shown in Fig. 6, and the general design scarcely differs from the original, or land type of the Babcock & Wilcox boiler.

Messrs. Hornsby very kindly made some trials for this paper with a water-tube boiler, which has been in use in their own works for about four years. This boiler has a total heating surface of 893 square feet, and a grate area of 14½ square feet. The heating surfaces had not been cleaned for some time, and after the trial there was a scale of quite ⅛ inch thick in places. The results obtained were as follows:—

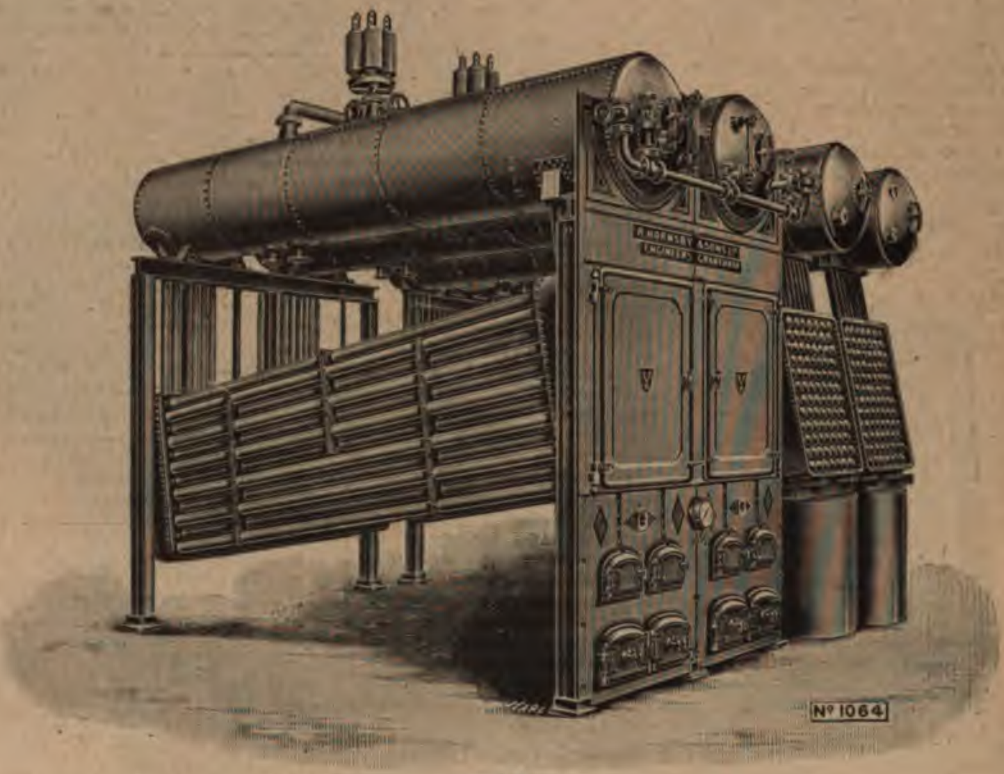


Fig. 6.

Quality of Coal,	Coal burnt per square foot of grate.	Water evaporated per square foot of surface.	Water evaporated per pound of Coal from and at 212 deg. F.	Water evaporated per pound of Combustible from and at 212 deg F.
Welsh ...	21·7	3·38	10 62	10·76
Newstead best hard steam in lump ...	26·3	3·16	8·21	9·20
Watnall slack with steam jet under bars to assist draughts ...	43·0	4·09	6·43	7·33

Some further trials were made with Astatke oil, the oil being sprayed on to the grate with a Holden and Brooks injector, the fire being started first with coal, and steam got up to work the injector. The grate was then covered with broken bricks to a depth of 3 to 4 inches, and a series of trials made, the results being all practically alike and as follows:—

Fuel used.	Fuel per square foot of grate.	Water evaporated per square foot of heating surface.	Water evaporated per pound of fuel from and at 212 deg. F.
Russian Astatke ...	22·36 lbs.	4·48	14·03

The foregoing results are all very satisfactory; this class of boiler is, as seen by the above results, to be a specially good one using liquid fuel.

The Belleville boiler has been the cause of much discussion in this country. In 1893 the Admiralty decided to fit it in the *Sharpshooter*. The results of the trials in this and other ships, and other information placed at the disposal of the Admiralty, have been such that up to the present there have been fitted, (Figs. 7 and 7a), or in course of construction, Belleville boilers for twenty-one cruisers of from 10,000 to 25,000 I.H.P., seven battleships of from 13,000 to 15,000 I.H.P., besides several smaller vessels, so that it is clear that our Admiralty engineering staff consider them the best for large ships at the present moment.

Whilst this boiler is somewhat similar to the previous two mentioned, in that it is fitted with comparatively large tubes in nearly a horizontal position, yet its details differ considerably; it consists of a large top cylinder or steam and water collector, and a series of elements made up of straight tubes coupled together in such a manner that they form a kind of flattened spiral tube of considerable length, the lower part of which is connected to the water inlet and the upper part to the top cylinder or steam collector. There are devices for regulating the feed inlet to the tubes and separating the steam and water from each other in the collecting cylinder; each of these elements consisted originally of about twenty tubes, each about 7 ft. 6 in. long and 4 in. inside diameter, screwed into malleable cast-iron couplers or boxes so as to form the returns of the flattened spiral (Fig. 7).

The effect of this is that each particle of water to be evaporated passes through a continuous tube about 160 ft. in length, arranged practically horizontally. It is found necessary in practice to reduce the inlet for the feed water, and return tubes are fitted so that the surplus water from the steam collector can return into the water chamber, and a non-return valve is fitted to prevent the water from the elements passing back up through this water chamber.

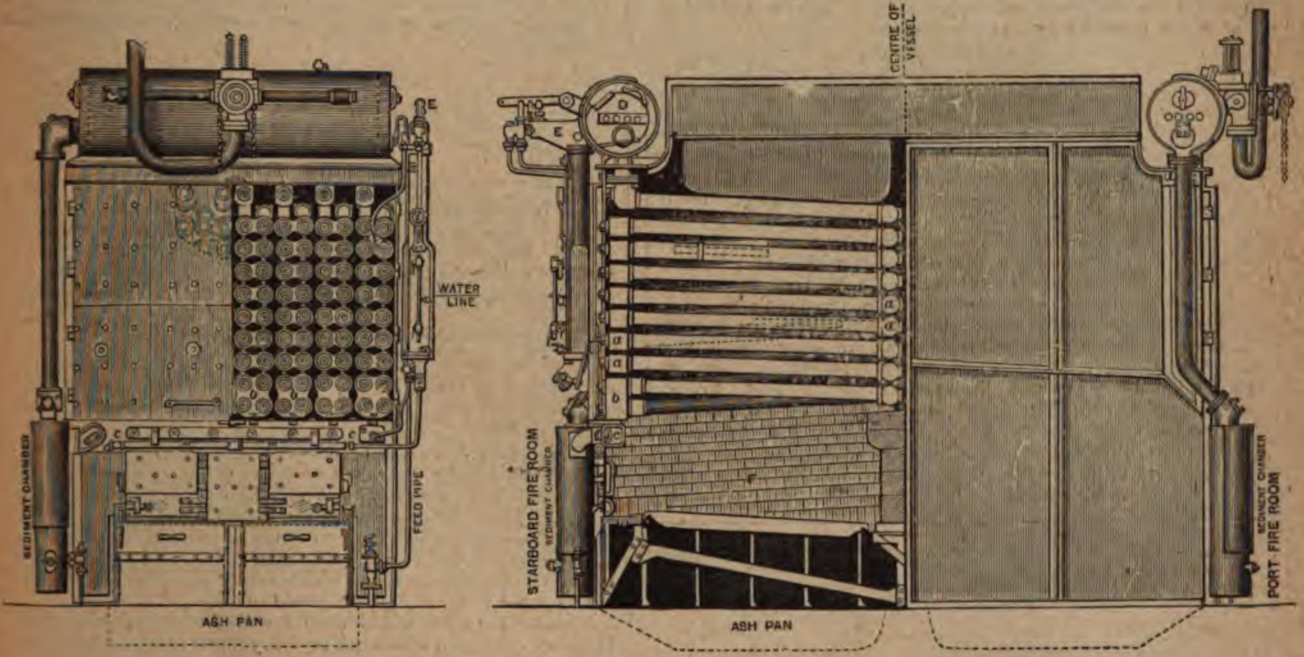


Fig. 7.

It is quite apparent from the construction of this boiler that there must be very considerable resistance to the circulation of the water and steam in these elements; the great length alone, without considering the number of bends, must cause much friction, and we can quite understand that a good many devices are necessary to get a continual circulation. In a sea way, where the relative levels of the back and front are continually changing, one can easily imagine that there will be a great tendency for the current to change its direction, and the circulation will then be anything but continuous. Again, with such a length of tube arranged in this manner the steam-bubbles must fill a very large proportion of its volume. Of course, the boiler is free to expand and contract, and in the later boilers a sort of roller beaming is fitted to facilitate this; but the experience of the merchant service is that no surface of a boiler other than a water-covered surface should be exposed to the heat of the gases, and if this is departed from the life of that part of the boiler is a very short one.

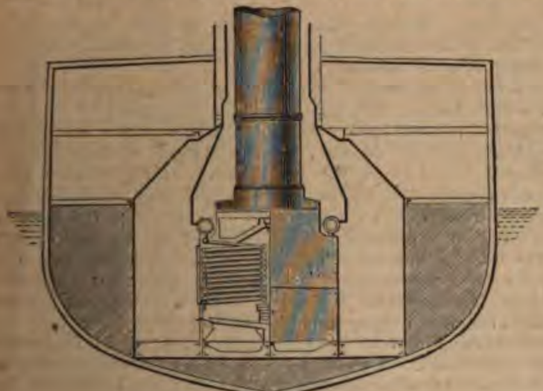


Fig. 7a.

In a boiler of this kind containing when cold 3,000 lbs. of water, when working at a rate of 12 lbs. of coal per square foot per hour of grate, it contained 2,400 lbs.; whilst with 20 lbs. per square foot its contents were 2,100 lbs.; and at 30 lbs. per square foot its contents were 1,600 lbs., or practically the tubes were little more than half full of water, although the water level in the boiler as shown by the glass was still the same. It is thus necessary to have a considerable amount of reserve feed at hand for boilers of this class, and the question of dealing with the surplus water in the boilers when changing from slow to full speed must cause anxiety, as it will be next to impossible to keep it all out of the engines, even with the best steam traps or separators.

The results on trials and actual working of these boilers as steam generators appear to be good and the tubes are fairly easy to replace, whilst there can be no doubt that the material and workmanship in them is of the very best. Whilst they have not yet been adopted for merchant service work, they are undoubtedly the most popular for naval purposes.

The results of trials on shore with two of these boilers, which were for H M.S. *Powerful*, were as follows:—

Coal per sq. foot of grate.	Steam pressure	Feed temperature	Pound of coal evaporated per pound of coal from and at 212° F.
18 lbs.	258	42°	10·81
24 lbs.	258	42°	10·42

And the results of the recent trials in H.M.S. *Diadem*, as given in *Engineering*, with the latest improved type of these boilers, which are fitted with a large feed heater in the uptake show that it causes a decrease in the temperature of the escaping gases to 500 deg. F., whilst the feed water is heated from 68 deg. F. This, of course, considerably increases the economy.

On the eight hours' emergency trial, when burning 21·14 lbs. of coal per square foot of grate, the indicated power obtained was nearly twelve I.H.P. per square feet of grate, and one I.H.P. was obtained per 2·36 square feet of heating surface, the air pressure being only 0·3 in.

On some further trials when burning 27·52 lbs. per square foot of grate, one I.H.P. was obtained per square feet of total heating surface, and the trials which were very lengthy were satisfac tory, the only defect noted being the blowing out of the fusible plugs, which are fitted to the elements to give warning in the event of their being overheated due to shortness of water, but this blowing out of the plugs was attributed to unsuitable material and not to any overheating.

The Thornycroft boiler, which has been and is now being fitted to a number of high-speed torpedo boats and torpedo-boat destroyers, has had a most successful career in this class of vessel, is shown in fig. 8 (pp. 19, April, 1894). Its principal features are the steam and water drums or cylinders which are connected together by the steam-generating tubes, the upper ends of which all terminate above the water level, whilst special return tubes of large section are fitted at the end. When these boilers are working under normal conditions a stream of water and steam is continuously being delivered by the generating tubes into the steam drum, the surplus water falling down the return tubes to the water drum, to be again passed through the generating tubes. It is claimed for these boilers that the circulation is rapid and continuous, there being no change of direction or any fear of the tubes being partly emptied through a change of current; they are economical as steam generators, and a great saving in weight and space is obtained with them, whilst no amount of forced combustion interferes with their working—in fact the faster they are worked the better the circulation.

Messrs. Thornycroft's have fitted an automatic feed regulator to these boilers, as must be necessary where a number of them are working together from one feed supply, and they are as near as possible automatic when being driven at their highest rate of working. A view (Fig. p. 230, Sept., 1895) of the automatic feed valve, which is of the float type, is shown, and when the boiler is working it maintains a constant water level.

Some very extensive sea trials with these boilers made in 1892 gave the following results :—

Steam pressure in Boiler.	Coal Consumption per square foot of grate.	Coal Consumption per I.H.P.	Funnel Temperature.
170 lbs.	17·8	1·75	438° F.
176 „	25·2	1·77	482° F.
177 „	34·5	1·87	590° F.

The engines were triple expansion and doubtless fairly economical, whilst the funnel temperature shows that the losses there were not great, even at such a high rate of combustion as 34.5 lbs. per square foot of grate.

Mr. Thornycroft, in a paper read before the Naval Architects in 1894, stated that as the result of some experiments he made he found that for every lb. of water evaporated 105 lbs. of water passed through the tubes, and that even at such a high evaporation as 20 lbs. per square foot of heating surface the generating tubes could not be overheated.

The *Speedy's* boilers gave 2·5 I.H.P. per foot of heating surface, and the total weight of boilers with fittings and water per I.H.P. was about 39·2 lbs., and the I.H.P. per foot of grate surface was 23 I.H.P.

The Yarrow boiler is also fitted to a great number of high speed vessels both in our own and foreign navies, and has been adopted by the Dutch Government for their cruisers. Its special construction is shown, and it consists essentially of a steam drum or collector, with two lower water chambers, connected together by a number of straight tubes simply expanded into them. These straight tubes, which are about 5 ft. long and 1⅛ in. diameter, form the steam generating surfaces, and the cross section of the boiler is therefore triangular with the grate at the base. The whole of the generating tubes have their upper ends below the water level in the steam drum, and hence they are called drowned tubes. No return tubes are fitted, as they are not considered necessary. The advantages claimed for this boiler are as follows :—

1st. The tubes being straight are easily cleaned, examined, or replaced, and require no special manufacture.

2nd. The angle of the tubes is such that they offer very little fractional resistance to the ascending bubbles of steam.

The tubes in this boiler being all below the water level, their normal condition is to be full of water, and therefore they are not liable to damage by corrosion when worked at low speeds; and, when forced, it is found that a certain number of the tubes nearest the fire are the ascending or uptake ones, whilst a number of others furthest removed from the heat of the fire were the downcast or return tubes, and were filled with practically solid water.

Messrs. Yarrow's system of automatic feed consists practically of a separate pump for each boiler.

The economy of these boilers is very high, as when evaporating at the rate of 3 lbs. per square foot of heating surface, the evaporation was 12 lbs. per 1 lb. of coal from and at 212 deg. F., whilst with the very high evaporation of 10 lbs. of water per foot of heating surface 10 lbs. of water were evaporated per pound of coal burnt.

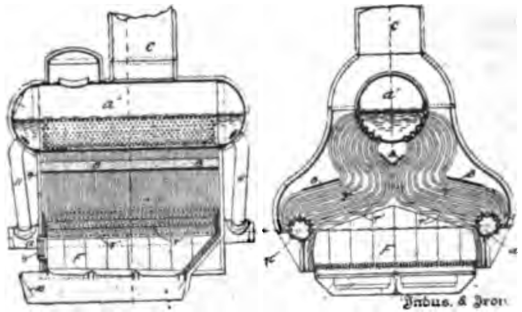


FIG. 1. FIG. 2.

FIG. 8.

These boilers have also been worked for days with a leaky condenser, and tried with a salt feed for some hours without the slightest injury to them, although the density was as high as 4·32s., and the steam pressure 150 lbs.; whilst through neglect one of these boilers was allowed to get so short of water that the upper ends of the tubes must have been red-hot. The only result was a slight leakage, which could be easily kept under with a force pump at 150 lbs. pressure.

Some sets of these boilers made for the Dutch Government are herewith compared with some ordinary marine type boilers in the same ships.

Ship's I.H.P.	Total weight of each boiler with fittings and water	Weight per I.H.P.	I.H.P. per foot of grate	I.H.P. per foot of heating surface
1,025	60 tons	1·066		
950	11 „	1·234	21	·47

The Reed boiler, a view of which is shown in Fig. 8, is invention of Mr. Reed, engineer manager of the Palmer's Ship building Co., of Jarrow.

This boiler consists of the usual cylindrical steam drum and two water drums; these are connected together by the generating tubes, the top ends of which are below the water-level—they are thus of the drowned type; the tubes are bent in a special manner to bring them over the furnace, and are fitted with an ingenious screwed connection at each end for fixing them in position, this renders them easy to replace; the tubes are 1 1·16ths in. outside diameter, reduced at the bottom end to 7-8ths in., which gives a little more room to get at the bottom nuts; outside return tubes are fitted to act as downcomers for the surplus water from the steam drum; diaphragm plates are fitted to cause the gases to traverse the greater part of the heating surfaces, and the air casing is arranged so that the air heated by radiation is led into the ash-pit, thus helping to keep the boiler-room cool, and heat the supply of air to the furnace at the same time.

A number of these boilers have been fitted or are in course of construction—something like eighty for the British Admiralty alone—and not only to the torpedo-destroyer type of vessel, in which they have given great satisfaction, but some of our third-class cruisers are also having them fitted. At present altogether about 110,000 I.H.P. of these boilers have been made, which, considering that the boiler has only been in use some four years, is evidence of its efficiency. It has been subjected to some severe tests: getting up steam quickly, checking the generation, and exposing the tubes to severe conditions of heating; but it has stood them remarkably well. Out of some 100,000 or more tubes there has not been a single failure of a joint.

Mr. Reed used an automatic feed regulator which is as near perfection as possible. The pressure to which these boilers are worked is from 210 lbs. to 300 lbs. per square inch, and the consumption of fuel at full power, with draught 3·2 in. of water, averages about 2·25 lbs. per I.H.P. The weight of boilers, complete with all fittings, casings, etc., water in and steam up, is 23.3 lbs. per I.H.P.

Mr. A. G. Mumford, of Colchester, has lately made a set of four boilers for H.M.S. *Salamander* (see supplement), views of which are shown. Their construction is somewhat different to all the others. The boiler consists of a steam drum or collector, and two water drums or cylinders, and a number of generating elements which are connected at their lower ends to the water chambers, and at their upper ends to the steam space of the steam drum. These elements are therefore not of the "drowned" type. A return tube of large diameter is fitted for improved circulation to the water cylinders. The elements in the older forms seem to have rather more joints than is desirable, but as they are of a special strong and simple construction they give no trouble. The tubes are expanded into the headers, and any of the elements can be readily removed if necessary, and another substituted, or the connections blanked if requisite. In the new type the number of joints is the same as in the Thornycroft.

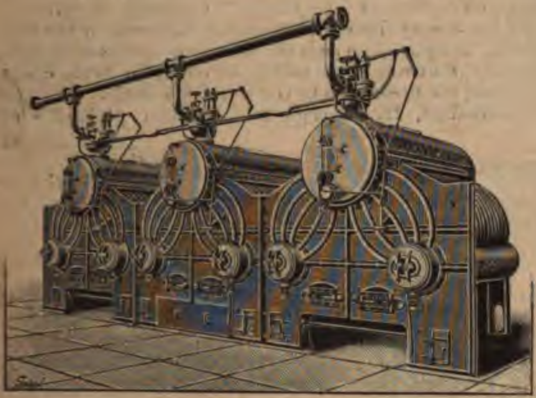


FIG. 9.

Baffle plates are fitted so as to compel the gases to travel the length of the boiler in the central part. They are then guided back among the tubes at each side, so that the products of combustion pass first to the back of the boiler along the centre, and are then returned along the sides. This makes the boiler a very efficient one as a steam generator. An automatic feed regulator is fitted to maintain the water levels.

A number of these boilers have been fitted to steam pinnaces and launches, and they are giving good results.

The result of evaporation with the *Salamander* boilers when burning 25 lbs. of coal per square foot in Devonport Docks 11·47 lbs. from and at 212 degs.

Another boiler which is making headway is the Clyde Patent Water-Tube Boiler, manufactured by Messrs. Fleming & Ferguson, of Paisley; this is shown in Fig. 9. Its construction is similar to most of the previous boilers of the express type. It consists of an upper steam cylinder and two lower water cylinders which are connected together by curved generating tubes expanded into them. These tubes at their top ends are below the water level in the steam drum, and are, therefore, of the "drowned" type. It will also be noticed that a row of tubes is kept outside the furnace presumably to act as down-comers or feeders for the conveyance of the feed to the water legs. The upper drum is sufficiently large to enable the tubes which are comparatively short to be drawn into it should they require to be replaced without disturbing the casing.

The following are some of the results of trials made with this boiler.

Trials of three Clyde Patents Water-tube boilers:

	No. 1.	No. 2.	No 3.
Grate area	9½ sq. ft.	20 sq. ft.	45·8 sq. ft.
Heating surface	540 sq. ft.	630 sq. ft.	1,650 sq. ft.
Coal consumed per square foot of grate per hour ...	24·8 lb.	20·3 lb.	30·3 lb.
Total coal consumed per hour	236 lb.	406 lb.	1,391 lb.
Water evaporated per hour	2,040 lb.	3,500 lb.	9,812 lb.
Water evaporated per hour from and at 212 degs. F.	2,468 lb.	4,260 lb.	11,345 lb.
Water evaporated per lb. of coal from and at 212 degs. F.	10·43 lb.	10·5 lb.	8·15 lb.
Water evaporated per lb. of combustible	11·15 lb.	11·25 lb.	8·7 lb.
Water evaporated per square foot of grate per hour ...	260 lb.	213 lb.	247 lb.
Water evaporated per square foot of heating surface per hour from and at 212 degs. F.	4·5 lb.	6·7 lb.	6·8 lb.
Quality of coal used ...	Welsh	Welsh	Scotch
Draught natural on all trials			

The evaporation per square foot of heating surface is very high.

Having now put before you all the boilers, we propose to deal with to-night, we wish to remark that in selecting these we do not intend it to be understood that we think they are the best, but we put them forward as types of the best-known boilers of the day, and we have, as far as time permits, pointed out their special features with a view to have you discuss their good and bad qualities and the lines on which they been designed, as it appears to us that the time is rapidly coming when the marine engineers of the Mercantile Marine will be called upon to take charge of this class of boiler, and if anything in our paper helps you to more thoroughly grasp the problem of the water-tube boiler we shall be repaid for the trouble we have had.

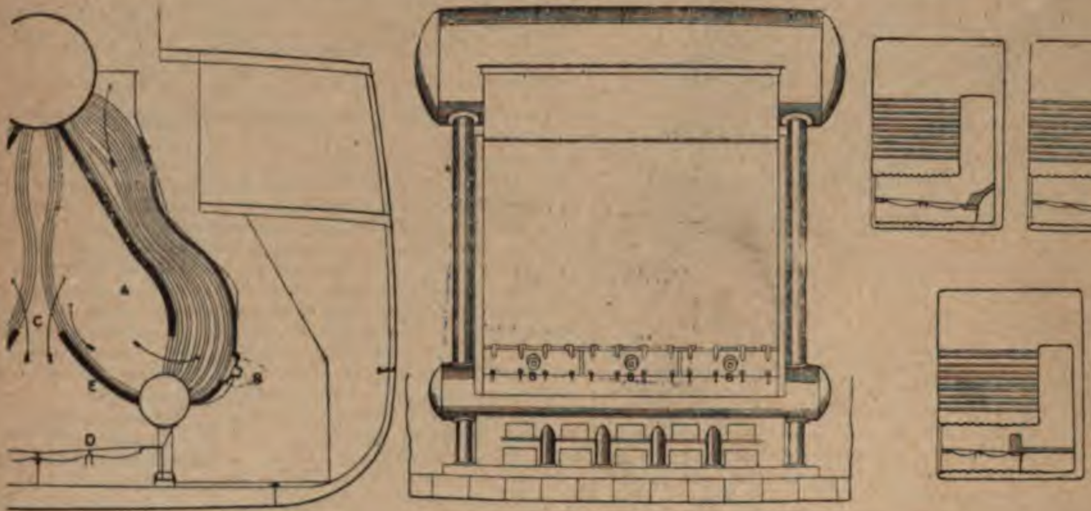
Mr. Normand in 1895 astonished many of the members of the Institute of Naval Architects when he informed them that a reduction of the weight of any part of the ship allows the whole displacement to be reduced by about four-and-half times the weight saved. His particular argument at the time was to show that feed water heaters and everything which went to increase economy saved weight and displacement. At that time the weight of his boilers and engines came out as low as 48 lbs. per I.H.P.; the Reed boiler gives us 23 lbs. per I.H.P.

Taking this against 200 lbs. per I.H.P. for the old Scotch boiler, makes it appear as if the universal adoption of the water-tube boiler for marine purposes is simply a matter of time.

WEIR'S WATER-TUBE BOILER.

MR. WEIR, in a paper read before the summer meeting of the Institution of Engineers and Shipbuilders at Sheffield, said this, like many other water-tube boilers, consisted—see diagrams herewith—of an upper steam-drum and a lower water-drum or drums connected by tubes, but differentiated from others by the arrangement of a secondary combustion chamber A between the tubes, having an inlet and outlet so arranged as to effect the complete admixture of the air and gases, and thus obtaining combustion before passing over the major portion of the heating surface of the boiler. In this boiler the author has endeavoured to reproduce the phenomena of combustion in the same manner as these occur in the best marine return-tube boilers, and, after continuous trial, he felt justified in submitting the arrangement as a solution of the problem of combustion in water-tube boilers.

In all cases the combustion was carried out as in the marine eturn-tube boiler, and it was fired in exactly the same way. I had, however, a distinguishing advantage in that the sto could look into the combustion chamber A through an aperture B provided for this purpose, and from the colour of the flame at the bridge opening C he could see whether the necessary amount of air was admitted, and if not, he could increase the supply by adjusting the opening of the furnace door. By this adjustment the gases could be effectually burned with the minimum amount of air to suit any rate of steaming, condition of fire, or quality of fuel. As a matter of actual practice, when the combustion chamber A was placed over and separated from the furnace D by the bridge wall E, it had been found that the most effective place to admit the air was through the furnace door, and not at the back of the furnace, as was the case in most boilers. It might appear as if this were a departure from the arrangement in the marine return-tube boiler, but it was really analogous to that which obtained in that type. It the "Weir" boiler, the gases from the fire passed through below the bridge wall E, the air passing over and between them and the wall, while in the return-tube boiler, the gases passed over the bridge wall, the air being admitted below them, and passing between them and the wall. Thus the only difference lay in the bridge wall being inverted. Besides this special feature of complete combustion of fuel, other points of advantage were briefly, ease of feeding, which required no more attention than was necessary with a Scotch boiler; independence of automatic complications; general simplicity of construction, which enabled the boiler to be made in large units of from 2,000 to 4,000 I.H.P., ; ease of stoking, &c.



Weir's Water-Tube Boiler.

Two most important results followed upon the complete combustion obtained in the "Weir" boiler, viz., complete absence of smoke, and the suitability of the boiler for burning practically any kind of coal, and giving good results.

SCOTTISH ENGINEERS AND SHIPBUILDERS IN SHEFFIELD.

THE summer meeting of the engineers and shipbuilders of Scotland was this year held in Sheffield, on the 15th, 16th and 17th of June. The programme of such a summer meeting, to which ladies are invited, is necessarily varied, and included scientific papers, visiting works, and excursions to noblemen's seats in the district. There was a local reception committee, which consisted of the Lord Mayor of Sheffield, the Master Cutler, Sir Alexander Wilson, Bart., and about 50 Sheffield manufacturers, while Professor Hardwick acted as secretary. Their share in the entertainment of the Institution included the opening of a large number of places of business for inspection by the visitors, the provision of luncheon for them for two days, and the arranging of trips into the country on Thursday and Friday; while in his official capacity the Lord Mayor gave a reception at the Town Hall on Thursday night, and the Master Cutler granted the use of the Cutlers' Hall for the other assemblies of the party.

The first meeting took place on the morning of Wednesday at 10 o'clock, at the Cutlers' Hall, when, before proceeding to business, they were welcomed by the Lord Mayor and the Master Cutler on behalf of the local reception committee. Members were presented to the Lord Mayor and the Master Cutler in the front room, and afterwards the company entered the Old Drawing Room where a platform had been erected. At the beginning the chair was occupied by the Lord Mayor. Others on the platform were Mr. George Russell, the President of the Institution, the Master Cutler, Mr. James Weir, Mr. James Gilchrist, Mr. Jas. Rollinson, Mr. E. H. Parker, Secretary of the Institution.

The Lord Mayor said: You will be surprised to see me occupying the unwonted position of your President, but I only do so for a few moments in order that I may extend to you, on behalf of the City of Sheffield, a very cordial welcome.

Sir Alexander Wilson, the Master Cutler, said he had great pleasure, on behalf of the Cutlers' Company, in giving the Institution a very hearty and sincere welcome to the City of Sheffield. He was quite sure the members could see in the city a great deal that was worth seeing, as ought to be the case in a place where the finest steel in the world was made.

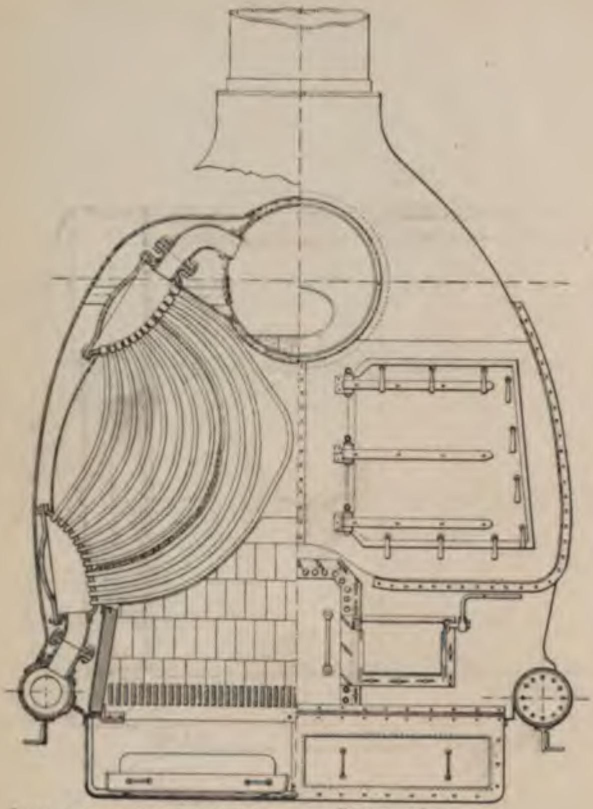
The President, Mr. George Russell, then took the chair vacated by the Lord Mayor, and acknowledged the kind expression which the members of the Institution had listened to, and the enthusiastic welcome which had been accorded them.

Mr. Ward, of Wm. Denny & Co., then moved a formal vote of thanks to the Lord Mayor, the Master Cutler and the Reception Committee "for the right royal welcome which had been given to the Institution on its first visit to the City of Sheffield." As an Institution we claim to have done a great deal of quiet, unostentatious work, and in the doing of it we have shewn a strong preference to stay at home. This was only the second occasion during 41 years that they had left home and laid themselves open—with ill-natured critics—to a charge of giddiness and dissipation. I have great pleasure in moving a vote of thanks to the Lord Mayor and to the Cutlers' Company who had so kindly granted the use of their historic hall for a meeting-place. In conclusion, I think I may fitly adapt Burns's lines to express my own feelings and the feelings of the Institution in regard to the hospitality we have received.

'When life's dark stream we ferry o'er—
And sure a time it will come—
In heaven itself we'll ask no more,
Than such a Sheffield welcome."

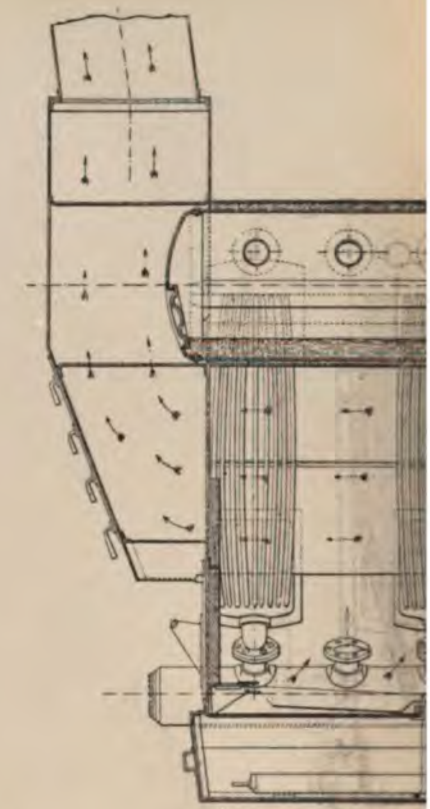
Mr. J. Mollinson seconded the vote of thanks, which the Lord Mayor and Sir Alexander Wilson briefly acknowledged.

The President then called on Mr. James Weir, of Glasgow, to read a paper on water-tube boilers.



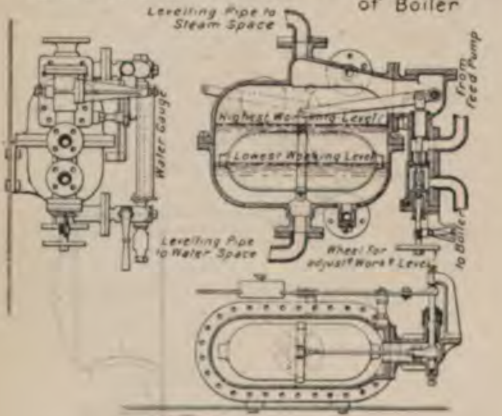
Transverse Sectn Thro Boiler

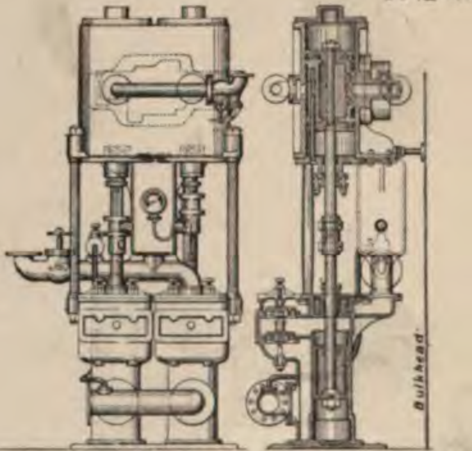
Front View of Boiler



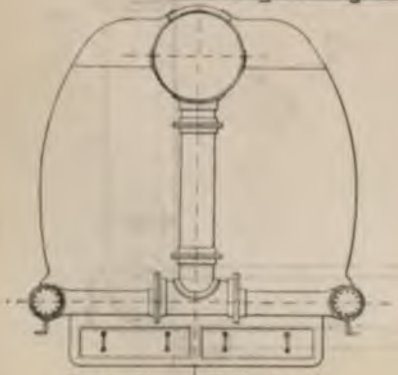
Sectional Elevatio

Boiler with one E

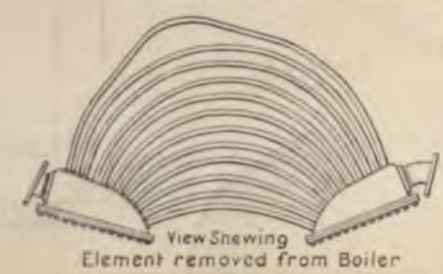

Levelling Pipe to Steam Space
Water Gauge
Highest Working Level
Lowest Working Level
from Feed Pump
Levelling Pipe to Water Space
Wheel for adjustᵗ Workᵍ Level
to Boiler



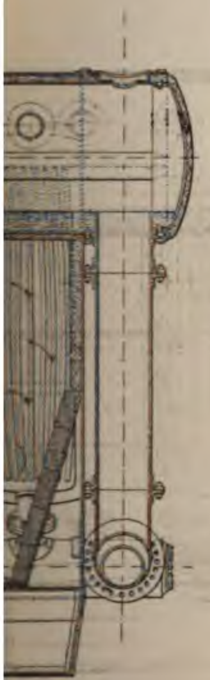
Feed Pump H M S "SALAMANDER" worked in Connection with Mumford & Anthony's Patent Automatic Feed Water Controlling Apparatus



Back View of Boiler



View Shewing Element removed from Boiler



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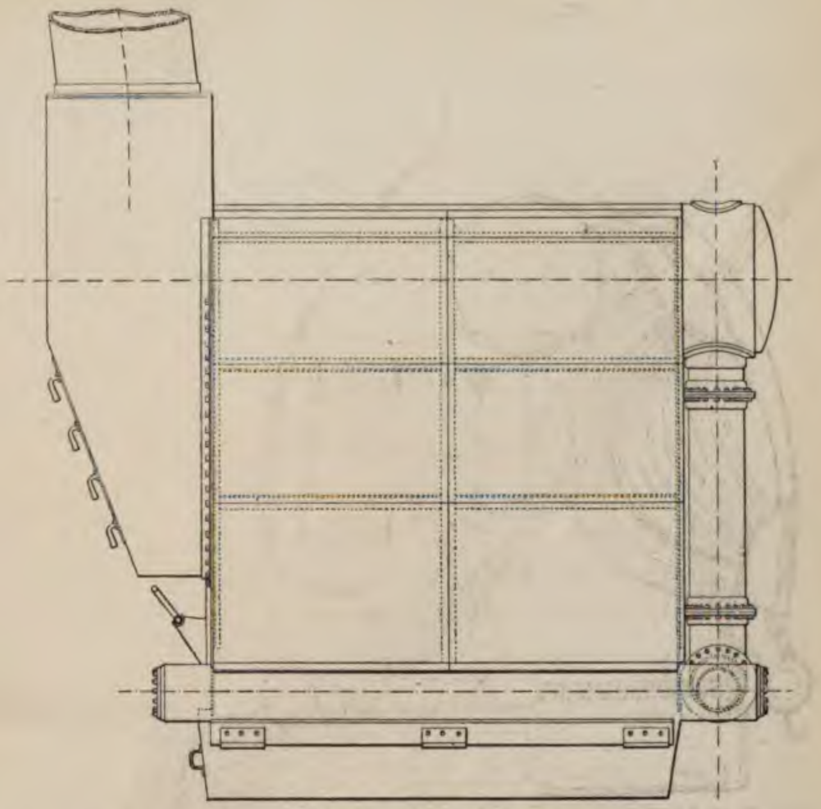
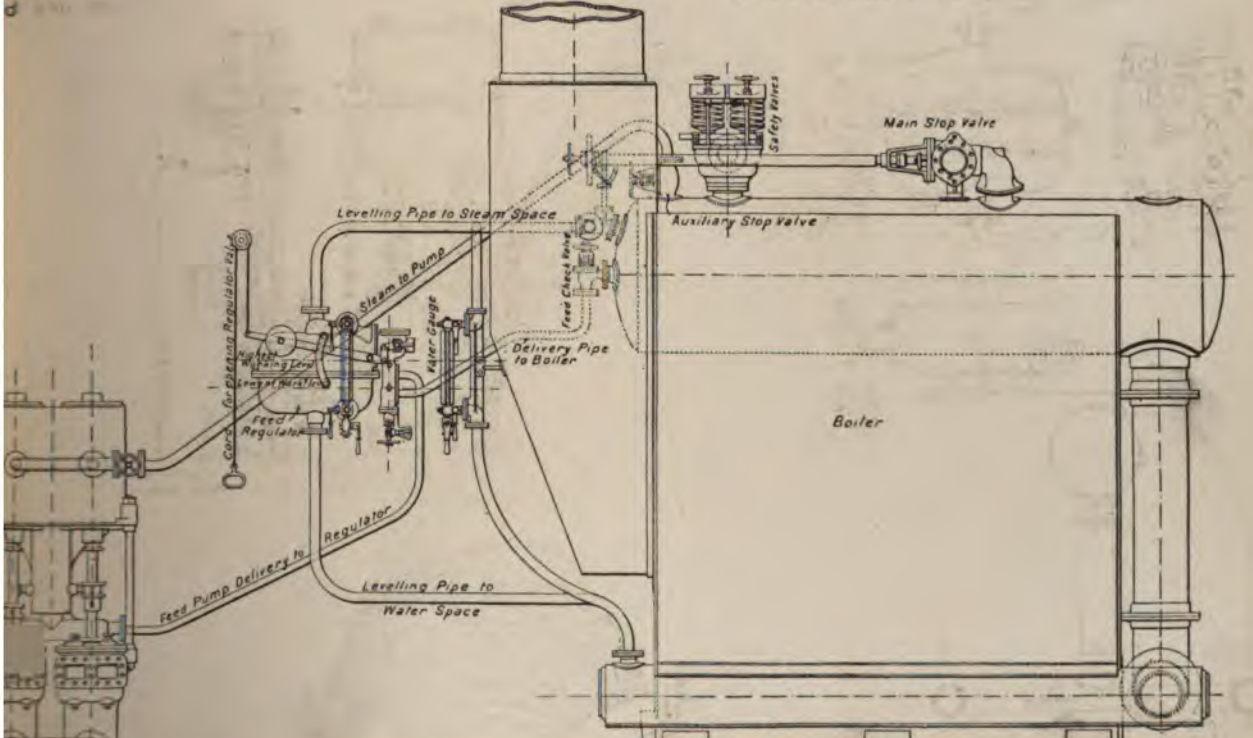


Side Elevation of Boiler


Main Stop Valve
Safety Valves
Auxiliary Stop Valve
Levelling Pipe to Steam Space
Steam to Pump
Cord for opening Regulator Val
Highest Working Level
Lowest Working Level
Feed Regulator
Water Gauge
Feed Check Valve
Delivery Pipe to Boiler
Boiler
Feed Pump Delivery to Regulator
Levelling Pipe to Water Space
Feed Pumps

Combustion in water-tube boilers.

The paper was read by Mr. Richmond. He said: Time will only permit me to read an abstract of the paper, and draw your attention to the more important points in it. At the present time it is notable that despite the great number of inventions in connection with water-tube boilers, the Mercantile Marine had so far held aloof from them. Water-tube boilers had been adopted by the Navy, but there the requirements were of a different order from those which obtained in the Mercantile Marine, and in ordinary industrial spheres. The reason for this is due to two causes: one was that the results claimed were obtained under the most favourable conditions, and the other was the low efficiency under continuous working. Take, for example, the marine return-tube boiler, there is the furnace in which the coal is burned and in inflammable gases produced, and the bridge which reduced the opening for the gases, and the air to pass into the combustion chamber, and so accelerated the speed of the gases, causing whirling motions which thoroughly mixed them with the air in the large space behind the bridge, and resulted in complete combustion. In practically all water-tube boilers the processes of burning the coal and gases was carried out in a single chamber, the furnace. In order that this large space over the fire might mix the air and gases it was necessary that it should receive the air all over the fire through the grate. The Weir water-tube boiler consisted, like many other water-tube boilers, of an upper steam drum, and two lower water drums connected by tubes, but differentiated from others by the arrangement of a secondary combustion chamber between the tubes, having an inlet and outlet so arranged as to effect the complete admixture of the air and gases, and thus obtain combustion before passing over the heating surface of the boiler. It had also this advantage that the stoker could look into the combustion chamber through an aperture provided for this purpose, and from the colour of the flames at the bridge opening he could see if the necessary amount of air was being admitted, and if not he could increase the supply by adjusting the opening of the furnace door. The ease with which complete combustion was obtained, by regulating the air supply according to the colour of the flame in the combustion-chamber, had the effect of entirely preventing the production of smoke. The Admiralty had adopted hand-picked Welsh coal as the standard for the Navy, considering it to be the most suitable for their purpose. But this boiler, with its secondary combustion-chamber, would give good results with practically any kind of coal. The coal endurance of a war ship was a most important factor in her capabilities as an effective instrument of war: the advantage therefore which any vessel possessed in being able to utilise, with good results, any class of coal obtainable at whatever quarter of the globe she might happen to be must necessarily give her a superiority, and greatly increase the range of her efficiency. The Welsh coal strike, and the operation of the Spanish-American war, were both object lessons which indicated the dependence of a navy fitted with water-tube boilers, not upon coal alone, but upon one particular kind of coal, and revealed to us a vulnerable point in our national armour.

Mr. F. J. Rowan (Glasgow), sent a written contribution to the discussion in which he said that whether the combustion with water-tube boilers was carried on by means of an ordinary grate, with or without forced draught, there was little doubt that Mr. Weir's arrangement of a secondary combustion chamber was on correct lines. But the question of prior importance was the primary combustion chamber formed by means of the ordinary grate—the best arrangement for conducting the combustion required by boilers. When Mr. Weir stated as a first condition necessary to a good boiler, that good combustion must be obtained, be left out of sight the important question—in what form of grate, furnace or combustion apparatus was it to be obtained?

Mr. G. Gretchin, chief engineer of the s.s. *Moskva*, of the Russian Volunteer Fleet, said Mr. Weir had been too modest to point out numerous advantages which his boiler possessed in addition to those mentioned. The disposition of the tubes was an excellent feature of the boiler, so, too, was the simplicity of construction. As a disadvantage, he pointed out its considerable height, and clumsy shape.

Mr. J. Mollison said: I have witnessed a number of tests and experiments to show how the spaces for the passage and mixing of the air and gases on leaving the furnace must be proportioned and adapted in order to maintain under all ordinary conditions of stoking the most effective and complete combustion whatever the quality of the fuel, and from what he observed there could be no doubt that Mr. Weir had succeeded in a large degree in accomplishing that, and thereby reducing the smoke at the chimney head to a minimum.

Professor Pipper, University College, Sheffield, said Mr. Weir claimed to be carrying out in this boiler the same arrangement which obtained in ordinary marine boilers. This boiler was, however, not quite like the ordinary cylindrical boiler. If the ordinary marine boiler had brickwork that would correspond with this boiler as he understood it. It had often been suggested that for the purpose of preventing smoke they should have built in the front of the furnace tubes a brickwork furnace in which combustion should take place in the first instance to get a much more complete and perfect combustion, but there had always been this objection that the object of general heat in a furnace was to get to the water a large surface of radiating heat. In such a boiler, where the furnace was covered with brickwork, the heat is to be transferred by conversion rather than by radiation, and there is great loss in the rate of transmission of the heat to the water. Where the draught is forced my objection will be more serious still in the loss in the transmission of the gases with the large volume of air passing through the flue.

Mr. Stromeyer (Manchester) said: I think combustion is most effectually obtained in brick combustion chambers. There is no doubt that a most perfect smokeless combustion can be obtained without bringing an amount of air if they had the whole surrounding fire very hot after they had burnt the material and passed the gases on into the boiler. Tests had been made with brick combustion chambers by the Manchester Association with the conditions not very favourable, and the results showed that there was no doubt of the economy and smokelessness.

Professor Barr agreed with Mr. Stromeyer on the question.

Mr. George Halliday (London) said: There is no question that Mr. Weir has laid his finger on a difficulty in the water-tube boiler question when he points out that there is no combustion chamber in which the hot gases can be mixed and consumed. The marvel is not that they had sometimes considerable waste in fuel, but that with such poor arrangements for the mixing of the gases they had such good results. There is evidence that the combustion chamber forms itself anywhere. I know a case in which when the draught was produced by jets of steam, the funnel soon became red-hot, showing that the combustion chamber was there. When a greater draught was made the funnel at once cooled down, showing that the combustion chamber had shifted back to the other end of the boiler—at least it had shifted from the funnel position. The length of the tubes appear to be too great, but since the diameter of them is about 2 in., this view would necessarily be modified.

A paper on "The Transmission of Heat through Plates from Hot Gases to Water" was next read by Mr. George Halliday (London).

Professor J. O. Arnold, of Sheffield University College, read a paper on "The Internal Architecture of Metals." He said: I am glad to have the privilege of addressing engineers and ship-builders, because they have always taken an interest in metallurgy, and secondly, because the science of metallurgy was born in Sheffield thirty-five years ago. The patient pioneer work of Dr. Sorby was received with indifference by the metallurgists of this country, and, although, as might have been expected, it took root in Germany, the plants there were of a sickly growth from a practical point of view. Micro-sections were shown, proving that the extreme weakness produced in gold and copper by minute percentages of elements like bismuth were due to the formation of films of alloy between the grains of the pure water, in other words, the stories of the metallurgical structure were weak mortar. The growth of iron into steel as the carbon increased was next exemplified by a series of slides, and he pointed out that true steel was formed when the iron contained ·9 per cent. of carbon. It was a fact of importance in connection with structural steel to remember that a critical mechanical point existed at ·45 per cent., where in pure materials the metal consisted of a mixture of equal parts of crystalline grains of iron and steel. Above this point, say at ·6 per cent. of carbon, the steel grains preponderated and gave the mass steely properties; below this point, say with carbon ·3 per cent., the iron crystals were in the majority, and the mass possessed the ductile properties of iron rather than the tenacious and brittle properties of steel. The fatal steam-pipe explosion on board the s.s. *Prodano* was thought by the Board of Trade Court to be due to an originally faulty pipe; but the matter was referred to the lecturer and the Committee of Lloyd's Register of Shipping, and, after four months of investigation it was proved that the brazing of the pipe had been deteriorated by the electrolytic action of impure oils till it became quite brittle and weak, so that after seven years' use the pipe exploded for a length of six feet at a pressure of only 130 lbs. per square inch.

Mr. Jas. W. Gilchrist (Glasgow), said: We, as engineers, are rather horny-handed sons of toil, and I presume that Professor Arnold desires us to give liberally towards the subject of metallurgical research generally

Mr. Jas. B. Mercer (Manchester) said: On the subject of copper tubes engineers ought rather to study the quality than the mere matter of saving a farthing a lb. in the price.

Mr. Mollison said, I should like to mention that I once tested some pipes that had been in use many years on board a vessel with low-pressure engines, where there were considerable quantities of fatty acids passing from boilers, and those pipes showed no signs of deterioration.

The company then adjourned for luncheon, in the Cutlers' Hall, on the invitation of the Reception Committee.

After luncheon the Institution paid visits to the works of Charles Cammell & Co. and John Brown & Co At the Atlas works they were received by Mr. J. D. Ellis, Captain Tressider and Mr. W. H. Ellis, and they passed through each department. They first inspected the big lathes used for finishing shafts, ammunition tubes, and large forgings of all kinds for ships, principally for men-of-war. They also went through the department devoted to the Purves patent-ribbed boiler flues, and witnessed the bending of plates into ribs which had already been made by rolling the welding into tubes and the subsequent rounding in machines. They were also shown the electric grinding machines. Two large presses, one for forging shafts and guns, which will exert a pressure of 4,000 tons, and the other for forging armour plates, which will exert a pressure of 10,000 tons, were shown at work.

At the Cyclops works the Institution was received by Mr. W. G. C. Hughes, Mr. J. N. Percival and Mr. F. Stubbs, and here, as in the other case, a most interesting time was spent. The Grimesthorpe works were gone through first, and the members of the Institution inspected the Siemen's steel-casting plant, forging marine shafting, and gun-forging under steam hammers, the rolling of engine tyres, forging under 6,000 tons hydraulic press, the machine shops for finishing shafting and other forgings, and the manufacture of railway springs and buffers.

A large party, including many ladies, visited Munro, Walker & Hall's establishment, where they were received by Colonel Bingham and Mr. C. H. Bingham.

In the evening, the Institution dinner was held at the Cutlers' Hall, under the presidency of Mr. George Russell. There was a large gathering, including the Mayor, the Master Cutler, Sir Wm. Arrol, M.P., Col. Vickers, Col. Bingham, Dr. Hck Messrs. James Mollison, James Gilchrist, John Ward, A. S. Biggart, James Rowan, Professors Barr and Watkinson.

Sir William Arrol, M.P., proposed "The City of Sheffield." He said: I have recollections of Sheffield, forty years back, and I have always felt that I would wish to make a pilgrimage to it. Sheffield has always made the best class of steel, and in the old days those using it were in the habit of taking as much care of it as if it were some precious metal. And although there is not the same value placed on steel, there was still a special value on good steel, and this came in larger proportion from Sheffield, than ever it did before. The steel trade had been the making of Sheffield, it had been an important steel making place as far back as the fourteenth century, and it had made progress second to no other town in the country. All the steel links for the original Forth Bridge, had to be made in 60 ft. lengths, and Colonel Vickers was a contractor for some 8,000 tons, while Messrs. Jonas & Colver were also large contractors. In every house all over the world where knives, forks, or steel were used, the name of Sheffield was found; in fact her name was so well-known and so popular, that we had even "Sheffield made in Germany." Long may Sheffield's popularity and prosperity continue.

The Lord Mayor, in acknowledging the toast, said: There is among Sheffield manufacturers to-day a determination to maintain the quality of their production. Sheffield cannot, like Glasgow, boast of any ancient charter which was granted by Charles the First. Charles the First lost his head, but the men of Glasgow never lost theirs. They had foresight, witness the navigation of the Clyde, the great scheme of street improvements, the magnificent waterworks at Loch Katrine, the tramways, and also the housing of the poor. And it is particularly noticeable that throughout all this municipal activity, it was always made to pay. He could not understand the great consumption of water in Glasgow, where the citizens used 50 gallons per head per day, whilst Sheffield only used 25 gallons. Either the citizens of Glasgow made themselves extraordinarily clean, or the citizens of Sheffield were content to be extraordinarily dirty.

Colonel Bingham in proposing the toast, "The Institution of Engineers and Shipbuilders," said: Sir William Arrol has spoken of the steel of Sheffield, and it is very *apropos* that on this occasion they should meet in the hall of the ancient Guild of Cutlers of Sheffield and Hallamstown, and test their steel. Yorkshiremen resemble Scotchmen in many characteristics, and I hope that this visit will weld together many friendships, which, like other Sheffield products well made, will stand the test of time, especially seeing how the interests of Sheffield are in touch with their engineering and shipbuilding trades. On their menu card was displayed the likeness of James Watt, a Scotchman born at Greenock, of whom they were so proud. The dinner you annually hold in the memory of this great leader of your profession, proves how you value that power which he utilised, a power superior to the unassisted labour of many millions of men, enabling us to fight our commercial battles against nations with cheaper labour, increasing immeasurably human comforts and enjoyments by a force which had endowed the public hand of man with a power to which no limit could be assigned. He coupled with the toast the name of a great successful and eminently scientific engineer—their President, Mr. George Russell.

The President, in answer, said: Our first President was Professor Rankine, the mathematician, the man of science and the theoretical engineer, and our Past President was Sir Wm. Arrol, the man of resource, and the practical engineer ready to overcome all difficulties and bring works of the greatest magnitude to a successful issue. Those two names, of world-wide fame, personified the method, the practice, and the importance of their Institution which has had a prosperous career and in a great measure fulfilled the objects for which it was founded.

The toast of "Our Guests" was proposed by Professor Barr, who said: The members of the Institution have every reason to feel at home in Sheffield. It was fortunate for Glasgow that a large river did not run through Sheffield and give transport facilities to the sea: for if it did, the experience I have gained of the enterprise of Sheffield people, leads me to think that the shipbuilding of Glasgow would very soon be located in Sheffield.

The Master Cutler in responding, said: We feel it a great compliment to be the guests of such an important body as the engineers and shipbuilders in Scotland. We hope the visit will be agreeable in every respect, and that "the chiel amang ye taking notes" will not go away empty, but will print it in their memories, that the people of Sheffield had been highly pleased to welcome them.

The proceedings concluded by the company singing "Auld Lang Syne."

On Thursday, the following works were visited—The Norfolk works of Messrs. Thomas Firth & Sons; the River Don works of Messrs. Vickers, Son and Maxim; The cutlery works of Messrs. Rodgers & Son; the electro-plating works of Messrs. Mappin & Webb; and the Clyde Steel and Iron Works of S. Osborn & Co. After luncheon, there was an excursion and drive to Welbeck Abbey. In the evening there was a Reception by the Lord Mayor in the Town Hall, when about 1,000 accepted the invitation. Friday was entirely given up to a drive to Bakewell, Haddon Hall and Chatsworth. Luncheon was provided at Bakewell and dinner at Baslow Hydropathic.

Messrs. John Brown & Co., Limited.—The directors of this company, in their thirty fourth annual report, state the long continued dispute with the engineers and other workmen materially affected the working of all departments last year. The extensions to provide for the new type of armour are nearly completed, and large deliveries will shortly be made of plates of this quality. In consequence, however, of the prospect of much greater requirements for the British and other Governments, the directors have commenced further considerable extensions in order to increase the output of armour. The collieries have worked well, but high wages and low prices have affected results. The net profit for the year is £61,127 16s. 3d., which, with a balance brought forward of £39,973 1s. 8d., gave a total of £101,100 17s. 11d. Out of this they recommend a dividend on the year equal to 6¼ per cent., and carry forward a balance of £29,600 17s. 11d.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from May 25th to June 24th, 1898:—

Apps, H. E. G., artificer engineer to the *Severn*, for the *Onyx*, to date May 22nd.

Barber, James, chief engineer to the *Pembroke*, for the *Arethusa*, undated.

Barr, Ernest, engineer to the *Victory*, for the *Conflict*, to date June 13th.

Bartlett, Charles P. W. (probationary), assistant engineer to the *Barfleur*, lent to the *Blenheim*, for the voyage out, to date June 3rd.

Bell, E., engineer, has been placed on the Retired List of his rank.

Bishop, Thomas H. B., engineer to the *Pembroke*, additional, for the *Spitfire*, to date June 3rd.

Byrne, Albert D., assistant engineer (temporary) to the *Diadem*, undated.

Cox, Albert E., engineer to the *Victory*, additional, in lieu of a chief engineer, undated.

Cox, Albert E., chief engineer (reappointed on promotion) to the *Victory*, additional, for the *Bellona*, undated.

Cutlack, Percy E. (probationary) assistant engineer to the *Northampton*, undated.

Elgar, George H., assistant engineer (temporary) to the *Diadem*, undated.

Fielder, John, fleet engineer to the *Blenheim*, undated.

Ford, Hugh L. M., assistant engineer (temporary) to the *Furious*, undated.

Gaisford, Harold, engineer to the *Australia*, additional, for the *Leda*, to date May 26th.

Gaisford, Harold, chief engineer (reappointed on promotion) to the *Australia*, for the *Leda*, to date May 31st.

Gallery, Edward, chief engineer to the *Vivid*, for the *Conquest*, to date June 6th.

Garey, Arthur, assistant engineer to the *Sans Pareil*, to date May 11th.

Gibson-Sugars, J. S., engineer, has been advanced to the rank of chief engineer in Her Majesty's fleet.

Giles, Harry L., assistant engineer to the *Barfleur*, undated.

Guyer, F., assistant engineer to the *Alecto*, to date June 8th.

Hill, Walter S., assistant engineer to the *Sans Pareil*, to date May 11th.

Hillier, Percy C. A., assistant engineer to the *Barfleur*, undated.

Humphreys, Henry, chief engineer to the *Pembroke*, additional, for the *Speedy*, to date June 15th.

Jacobs, Frederick G., engineer to the *Mars*, to date June 13th.

Johnson, Harry H., assistant engineer to the *Diadem*, undated.

Jolliffe, H., fleet engineer, has been placed on the Retired List of his rank.

Lane, J., staff engineer, has been placed on the Retired List of his rank.

Madge, Harry A., engineer to the *Severn*, for the *Onyx*, to date May 22nd.

Michell, W. H., fleet engineer to the *Vivid*, additional, for the *Retribution*, to date June 6th.

Mogg, W. G., chief engineer to the *Vivid*, for the *Sirius*, to date June 10th.

Moore, Thomas A., artificer engineer to the *Jason*, undated.

Page, Gilbert H., assistant engineer to the *Diadem*, undated.

Parsons, George, fleet engineer to the *Barfleur*, additional, to date June 3rd.

Rampling, Henry J., staff engineer to the *Vivid*, additional, for the *Charybdis*, undated.

Rundle, Mark, engineer to the *Furious*, undated.

Shattock, Thomas, engineer to the *Blenheim*, undated.

Simmons, George T., fleet engineer to the *Theseus*, to date June 3rd.

Smith, Edgar C., assistant engineer (temporary) to the *Barfleur*, to date June 3rd.

Snook, Victor E., engineer to the *Wildfire*, additional, for the *Landrail*, to date June 13th.

Spalding, Andrew, fleet engineer, to the *Sans Pareil*, to date May 11th.

Stewart, C.E., fleet engineer, has been placed on the Retired List, with permission to assume the rank of inspector of machinery.

Townsend, Walter E., engineer to the *Pembroke*, supernumerary, to date May 21st.

Townsend, Walter E., engineer to the *Benbow*, to date June 21st.

Travis, Albert E., engineer to the *Diadem*, undated.

Ward, John T. H., chief engineer to the *Revenge*, additional, for the *Boxer*, to date May 27th.

Wells, Thomas J., artificer engineer to the *Vivid*, supernumerary, to date April 1st.

Wiggins, William T., chief engineer to the *Furious*, undated.

Wilshin, J. B., assistant engineer to the *Furious*, undated.

Wingfield, Hy. E., fleet engineer to the *Vivid*, additional, for the *Shannon*, to date May 26th.

Wise, Frederick, engineer to the *Tyne*, reappointed on re-commissioning, to date June 1st.

Wright, Wallace, engineer to the *Barfleur*, additional, lent to the *Blenheim*, for duty as senior engineer on voyage out.

HOAR & BROWN'S HARDWOOD MARKET REPORT, JUNE 22nd. 1898.

TEAK, LOGS.—The consumption has been fairly large, and prices hold good, values at port of shipment being very fine, but stocks here are large enough to prevent any immediate rise. Parcels arriving here found buyers at rates satisfactory to shippers, although the class of wood is anything but gratifying. Some shippers have developed the practise of sending under forward contracts with a first-class guarantee a mixture of first and second-class timber, and imagine they are protecting themselves under the clause "first-class shipment as a whole," a totally unfair method to work upon.

Floating cargoes are scarce, and buyers for stock must be content with the small steamer shipments arriving at intervals.

PLANKS.—The market is being weakened by the importation of inferior and low-class goods, which have been arriving freely of late. The public sales, without reserve, have been taking most of this wood, but the small dealers are beginning to recognise the disadvantages of this quality and are becoming shy of the unknown marks.

Stocks are rather heavy but are largely made up of the inferior parcels mentioned. The best wood is mostly in the hands of large stockholders, consequently prices are safe at present against any decline.

MAHOGANY.—The stock is gradually assuming smaller proportions, as supplies have somewhat fallen off, but trade cannot be considered brisk, and the public sales are badly attended. Some low results have been recorded and those on the alert picked up some good bargains.

Honduras.—Small-sized wood has kept its price, but medium class has declined, as shown by the late sales. Large size of superior quality for panels still maintains its usual figure. The season's supplies are now at an end, and those holding stocks have until September to manipulate the market.

Tobasco.—Some of the cheapest and best bargains have been made lately at the sales. Large wood, not quite sound, has been sold at very inferior prices and, the dealers have reaped the benefit to a considerable extent. The Tobasco demand, however, was very slack for a period, hence the fall in the market, which continued for the last four sales, until the price actually became under African values. There is now reported only one steamer shipment for arrival, and prices will naturally advance a little.

Nicaraguan.—The market is clear of this wood as regards landed stocks, the object being to sell for arrival. Several shipments are expected during the coming season, and owing to the dearth of Honduras, this wood may be able to maintain its price, which at the present moment appears high.

Panama.—There is nothing here of any account, all the late shipments being in a wretched condition and totally unfit for general purposes.

African.—The demand is good and prices firm, especially for sound logs. The market is not so over-crowded as it was, and should supplies arrive quietly a more remunerative business may be done.

St. Domingo and Cuba.—There is nothing offering first hand, and those who purchased when stock was available are now reaping the benefit.

CEDAR.—At low figures it is easy to place parcels, but the demand is not strong, although supplies are small. There is just a hand-to-mouth business doing. Australian and Paraguay are flat.

SEQUOIA.—Stocks being so very light, a slight increase in prices is obtainable, but the quantity required by retail yards, apart from some of the larger cabinet businesses, is very slight, and a moderate stock for general purposes is sufficient.

KAWRIE PINE.—A very quiet trade is reported in planks, and logs are seldom enquired for. Prices are fairly firm.

AMERICAN WHITEWOOD.—Better business is shown in this than in any other lumber. Values are extremely low, and while this continues there will be plenty of trade.

JARRAH.—Several cargoes have changed hands lately. Prices are decidedly higher in consequence of supplies being unobtainable through scarcity of freight-room.

WALNUTWOOD.—Small logs are difficult to sell, but for knife wood there is a good demand and prices run high. For low-grade boards there is very little enquiry, whereas high class boards and planks find ready sale.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

CONTINUED activity characterises the engineering, shipbuilding, and allied industries of the Clyde and other Scottish districts, but this is scarcely so well represented by the number and importance of launches as during previous months. Only one or two steamers of any considerable size have been ushered off Clyde stocks, but there have been a fair number of moderate-sized cargo steamers and the usual number of steam trawlers, while from the Fairfield establishment there was launched early in the month H.M.S. *Highflier*, second-class cruiser.

Ever since its occurrence almost the sole topic of conversation in and about shipbuilding yards on the Clyde (where the frightful disaster to the *Daphne* on July 3rd, 1883, will never be forgotten) has been the catastrophe on the Thames at the launch of H.M.S. *Albion*. Of course the cause of the accident has been much discussed, and surprise is freely expressed that more efficient arrangements were not made to avert any danger which might arise from the displacement of such volumes of water. Such danger shipbuilders on the Clyde are quite familiar with, and precautions are invariably taken to prevent mischief.

Speaking at the luncheon following the launch of the *Highflier*, from Fairfield, Sir Donald Currie referred to wages troubles and delay in the completion of contracts. He referred to the somewhat remarkable experience they had had on the Clyde during the past twelve months. In that time there had been no fewer than four strikes. The *Braemar Castle* was prevented from having anything done to her engines for several months because of the engineers' strike; the *Carisbrooke Castle* could not have her internal fittings completed because of the cabinet makers' strike; the carpenters and the joiners quarrelled, not with their employers, but with each other, and walked out of the yard, some 500 strong, and now there is the strike of the Welsh colliers, who would not trust their leaders, and would not follow their advice, so that steamship owners must go to America, Japan, China, Newcastle, and even to Scotland—though the coal was not very good—for coal for their vessels. Such actions were a poor return for labour to give capital. It was strange that the working classes of this country did not know their own interests.

Peace, if not plenty, is however, now assured for at least six months to come in the Clyde shipbuilding trade. The secretary of the Engineering and Shipbuilding Federation of Employers, in accordance with instructions received from the joint committee appointed to deal with the matter, sent out letters early in the month to all the allied trades in the industry, intimating that it had been decided to advance wages five per cent. from the first of August next, the same to remain in force as customary for six months, with a month's notice on either side. This advance, on time rates, will work out at about ¼d. per hour and 1s. per week. The carpenters and joiners have accepted the offer, and there is little doubt that it will be accepted by other branches, although there is a feeling that the advance should have been granted to come into force after the fair holidays in July.

Messrs. R. Napier & Sons, Limited, Govan, contracted about the end of May with the Royal Mail Steam Packet Co., Liverpool, to build for them three powerful mail steamers for their West Indian trade. The new vessels will be about 6,000 tons gross each, and will be similar in all essential respects to the *Magdalena*, built for the same company in 1889. Triple-expansion engines, capable of driving the vessels at a high rate of speed, will be supplied by the builders.

Messrs. Charles Connell & Co., of Scotstown Shipyard, Whiteinch, received also, about the end of May, an order for two screw steamers of considerable deadweight carrying capacity.

Messrs. Blackwood & Gordon, of Port Glasgow, have been entrusted by the City of Dublin Steam Packet Co., for whom they have already built extensively, with the building and engining of a steamer to be engaged in the passenger and cattle carrying trade between Liverpool and Dublin.

Messrs. Caird & Co., shipbuilders, Greenock, have contracted to build and engine another steamer for the Pacific Steam Navigation Co., Liverpool. The vessel, which will be of 3,000 tons register, will be a duplicate of the steamer which Messrs. Caird are at present building for the Pacific Co. The firm have recently handed over to the P. & O. Co. the s.s. *Isis*, of 2,500 tons and 7,000 I.H.P., for that company's accelerated mail service between Brindisi and Port Said. She left Greenock on the 20th ult. for Southampton, where Sir Thomas Sutherland, the Speaker of the House of Commons, and a party of members, also a number of directors, went on board for a short cruise in the English Channel, previous to her being placed on her station. At her official speed trial on the Clyde, about two weeks ago, the *Isis* obtained a speed said to be considerably in excess of the guarantee. The *Osiris*, a sister ship, is now being fitted with her machinery by Messrs. Caird & Co.

Messrs. Taylor & Mitchell, who recently acquired ground from Greenock Harbour Trust for a shipbuilding yard, have secured an order for a steel screw steamer for an east country firm.

The Clydebank Engineering and Shipbuilding Co., Limited, are erecting new saw mills, at present at the west end of their yard, and still further extensions, for which lining has been granted, will be commenced immediately. These consist of a large general store, and an addition to the shipyard engine-shop.

Messrs. Donaldson, Aitken, & Scott, Govan, have contracted to build a cargo steamer of 900 tons and 450 H.P., and another of 2,300 tons and 600 H.P., both for English owners.

Messrs. David White & Co., launch and boat builders, of Plantation, Glasgow, who were the first to build an aluminium boat on the Clyde, have been requisitioned lately for the production of a number of other craft, in which aluminium is the principal material in the structure. Teak has in most of these cases been used to some extent for finishing off, but in the case of the latest craft turned out, aluminium has been used exclusively. This boat has been prepared in detachable sections for a party proceeding to Klondike, lightness and portability of course being of the first importance. Although 18 ft. long, the little craft only weighs a little over 2 cwts., and when the sections are packed into each other, the whole can be put into a small box or kit-bag.

The Welsh coal strike has caused heavy shipments of coal latety at Glasgow, and in evidence given before the Select Committee of the House of Commons on the Renfrew Harbour Bill, by Mr. Charles Forman, C.E., of Glasgow, who is professionally retained in connection with the projected works, it was stated that the quantity loaded showed that the cranes at Glasgow could not work more than 80 tons an hour in a day of 21 hours. Ships were even now lying at Glasgow waiting to be loaded with coal, which would not be the case had Glasgow had adequate modern appliances for dealing with the coal trade. Glasgow was deficient in quay storage and railway depôt ground. For all such purposes the railway and general land accommodation at the Glasgow docks was only 1·99 acres per acre of water. If the whole ground were available for docks for coal-shipping purposes, it would not be sufficient for carrying out a modern mineral trade, and it was a good deal less than was proposed to be provided at Renfrew, although their ground was compact, which could be laid out to the best possible advantage. The actual figure proposed at Renfrew was 2·38 acres of land to every acre of water.

At the same enquiry some interesting information was elicited regarding the dredger building business of the well-known firm of Messrs. William Simons & Co., Limited, Renfrew. Provost Brown, Renfrew, who is chairman of the company, said that his firm was one of the oldest concerns in Europe for the building of dredgers. In 1862 some 500 vessels annually used the harbour of Renfrew, but as the practice of building larger ships grew, Renfrew fell behind with its shipping trade, the harbour being no longer capable of accommodating the modern class of vessels. His own firm was at a great disadvantage in the fitting out of the larger class of vessels which they built, because the existing harbour was incapable of accommodating them. At the time when his firm built the dredgers for cutting the canal from Amsterdam to the North Sea, they had no competitors in the whole of Europe. There were now some half-a-dozen firms on the continent competing with them, at least in respect of the smaller class of dredgers. Of course his firm tried to keep pace with the competition, but to be able to do so successfully they required better accommodation than they now had at Renfrew for fitting-out purposes. Sometimes they were asked to tender for fitting-out purposes only, and in respect of that branch of their business they were greatly handicapped as compared with many of their competitors. He believed that if this dock was made, his firm would be able to enter into contracts which they could not now do. There would not, in his opinion, be any difficulty in raising the quarter-of-a-million required for the new harbour.

Regarding the effect of the Welsh coal strike in sending steamers to Gelasgow for bunker coal, several very big steamers have been supplied. One of them was the new Houlder liner *Beacon Grange*, which had a most successful trial trip during the month. She loaded a general cargo for the River Plate—locomotive engines at Glasgow, and other cargo at Liverpool—and took on board 2,000 tons of Slamanan steam coal; an order which, but for the Welsh strike, would have gone to Cardiff. The *Beacon Grange*, built by Messrs. Workman, Clark & Co., Belfast, is one of the finest vessels of her class ever constructed. It is for the homeward requirements, however, that the vessel has been specially built. She has accommodation for carrying an immense amount of perishable goods. In her refrigerating chambers she can stow no less than 150,000 carcases of beef or mutton, as well as an abundant supply of fresh provisions and vegetables for consumption by the passengers and crew on the voyage. There is also room for carrying 400 head of live cattle and 1,500 sheep. As well as being a magnificently equipped vessel for the frozen meat trade, the *Beacon Grange* is provided with accommodation for about 50 passengers.

Clyde defences have formed the subject about which brisk agitation has been going on for some time past, both in and out of Parliament, and a deputation, more numerous and influential than previous ones, was received by the Marquis of Lansdowne, Secretary for War, on 23rd ult. The deputation was composed of representatives of the Glasgow Chamber of Commerce, the Glasgow Corporation, the Clyde Trust, the Greenock Chamber of Commerce, the Greenock Corporation, and other bodies. Several Glasgow and West of Scotland members of Parliament also took part in the deputation, the result attending which promises to be of a more tangible nature than has hitherto followed representations on the same important subject.

New tube works are about to be started at Coatbridge by two late members of the firm of Messrs. A. & J. Stewart, of Clydesdale Messrs. Brown & Wotherspoon. The capital is to be privately subscribed, and will amount to £150,000. It is understood that the new firm will make solid-drawn tubes, such as are now so largely in request, for water-tube boiler manufacture.

The steel making, engineering, and kindred works at Motherwell continue to be exceedingly busy, and not only are extensions being made to existing establishments, but arrangements are at present being made for the starting of fresh works. One of these, it is understood, will be situated in Park Street; two Motherwell gentlemen being the chief promoters.

Messrs. Whyte & Mair, of Tay Foundry, are the purchasers of the Dock Street Engineering Works, Dundee, belonging to the sequestrated estate of Messrs. MacFarlane, Machan & Co. It is only little more than a year ago that Messrs. Whyte & Mair commenced business in Tay Foundry, but during that short period they have succeeded in building up an extensive business, and it is with the view of relieving the pressure at Tay Foundry that the Dock Street establishment has been acquired. The firm intend to carry on the works on the same lines as formerly, viz., marine engineering, boilermaking, and all classes of ship repairs. The firm employ about 400 hands at Tay Foundry, and at the Dock Street Works about 100 workmen will be employed.

Messrs. W. C. Martin & Co., electrical engineers, Glasgow, are very busy in their marine department at present, amongst their more important contracts being one to fit the large Cunard Liner, *Ultonia*, launched two weeks ago from the yard of Messrs. Swan & Hunter, Wallsend-on-Tyne, with a complete installation of electric light, including duplicate engines and dynamo.

The guarantee fund for the Glasgow International Exhibition in 1901, up to date amounts to £390,000, and special efforts are now being made to increase the total to at least £500,000.

The members of the Glasgow Technical College Scientific Society, visited the shipbuilding yard of Messrs. Barclay, Curle & Co., Whiteinch, on the 18th ult., and were conducted over the various departments, and alongside the vessels on the stocks. At the close of the visit Mr. R. M. Neilson, in the absence of Mr. Raphael, the retiring secretary, presented the Society's gold medal to Mr. Andrew Stewart for his paper on "Multiphase Electrical Machinery." Mr. Stewart briefly acknowledged the honour. It was also announced that Mr. Nisbet Sinclair, M.I.N.A., M.I.M.E., &c., had been elected president for two years.

The committee of the scientific societies of Glasgow, formed for the purpose of organising a fitting reception for the British Association when it visits Glasgow in 1901, the year of the projected International Exhibition, and the opening of the twentieth century—has resolved to prepare elaborate handbooks for presentation to the visitors, relating to Glasgow and the Clyde valley, and dealing with such subjects as archæology, geology, natural history and engineering and shipbuilding industries. Each handbook will rest in its preparation with a special committee, that on engineering and shipbuilding having as its convener, Mr. Robert Caird, of Messrs Caird & Co., Greenock.

The summer meeting of the Institution of Engineers and Shipbuilders was held in Sheffield on the 15th ult. and two succeeding days, about 100 gentlemen and half that number of ladies journeyed from Glasgow on the 14th. Their reception in the City of Steel was of the most cordial description, and the measures provided for their entertainment and edification were on a lavish and most hospitable scale. Some little disappointment was, however, caused to several of the visitors who were associated with steel works in the West of Scotland, through not receiving the invitation cards, without which there was no admission, yet for which they had been led to suppose they had, as members of the Institution invited to Sheffield, only to apply. Large parties, however, visited the various works which were named in last month's notes, and were immensely interested and impressed by what they saw. Details of the meetings and of the visits to works are given elsewhere in this issue.

The Board of Trade has appointed Mr. W. David Archer as principal shipwright surveyor, as the office is quaintly called, in succession to Mr. Wimshurst. Mr. Archer is widely known in shipbuilding circles, having been with Messrs. Thomson's Clydebank Engineering and Shipbuilding Co., for 14 years, during the latter half of which he has occupied the responsible position of naval architect of the establishment. He went to Clydebank in 1885, after completing the full course in naval architecture with distinction at the Royal Naval College, Greenwich. He had formerly served his apprenticeship in the shipyard and drawing office of Messrs. Oswald Mordaunt & Co., at Southampton.

The position vacated by Mr. Archer, at Clydebank, is being filled by Mr W. J. Luke, of the Admiralty, who is well-known in the Clyde district, as well as in other parts where naval shipbuilding is carried on. He has been for several years an important member of Sir William White's department at the Admiralty, and, as assistant constructor, was largely responsible, under Sir William, for the design and construction of the *Powerful* and the *Terrible*, and later for all the vessels of that description. He had also, it is understood, much to do with the work in connection with the Royal yacht now building, so that he will be a valuable acquisition to the Clydebank Co. He has had a splendid training, having been a distinguished student at the Naval College, Greenwich, where, for some years, he has been a lecturer on naval architecture.

THE TYNE.

(*From our own Correspondent.*)

Shipbuilding.—The condition of uniform briskness now prevailing in the Tyneside ship-yards is, it is safe to say, unprecedented, for there is scarcely a single instance in which night-shifts are not maintained in one or more departments, and in none of the yards—excepting the two that are being got ready for starting—is there a vacant berth to be seen. The total work in progress, speaking approximately, cannot be less than 200,000 tons, and there is good reason to believe that there is fully as much at the back of it. It is pleasant to be able to record so satisfactory a state of matters, and in spite of the wages agitations now going on, no good purpose can be served by trying to minimise the importance of the fact that work, both present and prospective, is abundant. The circumstance of work being plentiful is not everything. Much of the work now in hand was contracted for early in the year at the low prices of the period, and until these contracts are worked off it is highly inexpedient that wages should undergo any considerable change in the direction of enhancement. Luckily, the workmen do not appear to be quite so exacting on the present as on many past occasions, and we are pleased to hear that in several instances settlements have been effected with sections of the men on the principle of deferred instead of immediate advances. No settlement has, however, as yet been effected with the most important section of all, namely, the "black squad"; but, we believe, the difference in this case is not so much one of wages as the question of irregular attendance at work, especially on the part of the riveters. The unconscionable disregard of other people's well-being displayed by some of these men has become quite a scandal; for it is no uncommon thing to see groups of drillers, labourers, and rivet heaters laid idle by the wilful abstention from work of a number of the riveters engaged on a ship. It is time that this evil was seriously grappled with, and we are pleased to note that the employers seem to be very much in earnest at the present juncture, in concerting measures to put a stop to it, or at all events, bring it within less hurtful limits. If England is to hold her honourable place in the march of industry, it must be seen to that drink indulgence does not interfere with work.

In briefly reviewing the condition of work in each yard, it is necessary to begin with the Elswick establishment, and here we find a large battleship, a couple of cruisers, and some torpedo destroyers in progress, besides three war vessels getting fitted out in the river. In the initiatory department of frame turning a night shift is maintained, and for weeks past the deliveries of steel plates and other material have much exceeded the average. At the company's Low Walker yard preparations are being made for putting down a vessel ordered by the West India and Pacific Steam Shipping Co. This vessel is to be over 500 ft. long, and will be fitted up in a superior manner. There are some other vessels of a special class to be laid down, and the yard is being enlarged to admit of the formation of longer building berths.

Messrs. Wigham Richardson & Co. have secured an order from the North-German Lloyd's for a vessel of the largest class and of superior equipment. It will be interesting to watch the progress of this vessel, and of the two similar vessels which, it is stated, are about to be laid down at Hamburg for the same owners. We are disposed to think, of course, that in the event of the keels being laid about the same time, the English built vessel will be the first to touch the water; but this is a point which is open to disputation, and the forecast here indicated might be easily reversed through the occurrence of one of our periodical labour conflicts, or through the continuance of the bad habit of time-losing before referred to. Whether the time be unduly prolonged however, or otherwise, in which the Tyneside firm may be engaged in completing their contract, there can be no two opinions as to the fact, that when it is completed, it will be in a manner creditable to one of the contracting parties, and satisfactory to the other.

We are pleased to note that Messrs. Hawthorn, Leslie & Co. have, in accordance with modern ideas of progress, decided to remodel and re-equip their yard at Hebburn, in such a manner as to place it in rank with the first firms in the world. This comprehensive task has already been begun, and some of the shops have been dismantled with a view to reconstruction, while new machinery has been ordered to supersede the greater part of the existing plant. The alterations are to be of a most thorough character, and we believe, it is intended ultimately to adopt electrical power for the driving of the machinery in all the shops. The building berths also will be lengthened, and it is not improbable that an extension of the graving dock accommodation will come within the category of improvements. The latest orders booked by the firm are two large meat-carrying steamers for Messrs. Milburn & Co., and two similar boats for the Federal Steam Navigation Co., Limited.

Messrs. C. S. Swan & Hunter have accepted an order from the Shaw, Saville & Albion Co., Limited, to supply a large steamer, specially equipped for employment in the frozen meat trade, by a date well forward in 1899. The firm have several other vessels of an important class in hand; but having the advantage of exceptional means for turning out work with promptitude, there is little doubt about their being able to fulfil their contract obligations to the letter. The construction of the pontoon dock, ordered by the Vulcan Co., of Stettin, in October last, is perhaps the most remarkable example of rapid execution on record; for the whole of the work was done inside of half-a-year, and from the date of the order to the date of the dock's arrival at Stettin, only seven months elapsed. Considering that the dock is the largest ever constructed—on the pontoon principle—this is a remarkable achievement. The fine new Cunard steamer *Ultonia* is, with others, being fitted out beside the yard.

The Palmer Shipbuilding and Iron Co. have now in hand three vessels whose aggregate tonnage exceeds 30,000 tons. Two of these are for the British Shipowners' Co., and one for Sir Christopher Furness. Big cargo carriers are more than ever the order of the day, the conviction being now general that vessels of large capacity are more economical to work than those of moderate tonnage. In spite of the evident preference for vastness however, there is still a place for vessels of a handy type, whose carrying capacity does not go beyond the modest figure of two or three thousand tons, and though at the moment there is but a limited demand for vessels of this class, we believe their time will come again, as in certain trades they are indispensable. In the meantime, nearly all the vessels that are being ordered are of the larger type, and nothing under 5,000 tons seems to be worth mentioning. In addition to the boats on the stocks, there is quite a small fleet of vessels getting fitted out beside the Palmer Co.'s yard, among which are included two cruisers and a number of torpedo destroyers. The graving dock and slipway are occupied with vessels under repair.

The berths of the Tyne Shipbuilding Co.'s yard continue to be fully occupied, but this is no more than might be expected, seeing that in the dullest times this establishment has invariably been well provided with work. Messrs. Readhead's yard shows no exception to the general briskness; and at Messrs. Eltringham's and other yards, where small craft are built, business is also very active. In the repairing line there is a good deal of work going on, and the graving dock accommodation of the river is being pretty fully utilised.

Engineering.—One or two meetings have taken place between the employers and the representatives of the engineering operatives, with reference to the claim for an advance of wages put forward on behalf of the latter; but the details have not transpired, and all that can be said is, that the matter is still in abeyance. The employers have many good reasons for refusing an advance; and it is well known that they could do so at this juncture, without any fear of bringing upon the industry the infliction of a strike. Notwithstanding these facts, however, they may, with a view to promote the growth of a kindly feeling—which of late has been sadly lacking—make an offer to meet the operatives half-way, and it seems not improbable at this moment that a settlement may be arranged on some such basis as this.

The Wallsend Slipway and Engineering Co., Limited, have been commissioned to supply the machinery for the West India and Pacific Co.'s steamer, about to be laid down at the Walker yard of Messrs. Armstrong, Whitworth & Co. The alterations to the machinery of the s.s. *Orient*, which were of a very extensive nature, were completed at the end of May, and the vessel had her trial trip early in June, the results being in every way satisfactory. On her journey up to London, which was undertaken immediately after the preliminary trial, the vessel did an average of 18 knots, and the opinion was freely expressed that the alteration contract had been carried out in a way that could not be excelled. So pleased indeed were the owner's representatives with the performance of the altered machinery, that the prospect of similar contracts coming from the same quarter in the future seems assured.

At the Neptune Engine Works some good orders have been booked, and it is stated that a considerable extension of the works is in contemplation.

The North-Eastern Engine Works, Wallsend, have turned out a number of important contracts this year, and are still exceedingly busy. The Palmer Co.'s engineering department is also very actively engaged; and at the St. Peter's works of

Messrs. Hawthorn, Leslie & Co., business is as brisk as ever. Messrs. Robert Stephenson & Co., of the South Street Engine Works, Newcastle, have an order for two sets of engines and accessories, to be supplied to two vessels about to be built at the firm's Hebburn yard, to the order of local owners. In the locomotive department there are close on 100 engines to build, and the oil engine department is also busy. An unusually large output from the works may be looked forward to in the present year.

An installation of Meldrum furnaces has been put in for the North-Eastern Railway Co., at their Tyne dock warehouses, and very satisfactory results are reported. The marine adaptation of the Meldrum system has turned out a distinct success, improved speed and lessened smoke, on a smaller consumption of fuel, being the resulting advantages in all cases. There are now no less than 500 boilers, fitted with Meldrum furnaces, in the north.

Electric Lighting.—Messrs. Holmes, the well-known electric light and power engineers, have made a further addition to their premises, and have orders enough in hand to render the utilisation of all their added space an urgent necessity. Messrs. Clark, Chapman & Co. are also as busy in their electric department as could be wished, and at Messrs. Scott & Mountain's works a similar state of things prevail. The British Illuminating Co., Limited, of 44, Blackett Street, Newcastle, have just carried out a lighting installation, with acetelyne gas, on a large steam trawler at Shields. This is the first vessel so lighted in the north, and we are pleased to hear that the result has proved most satisfactory. The first cost of lighting with this illuminant is small, and for certain types of vessels it is invaluable. The apparatus can be worked by the most inexperienced person, and occupies but a small space, while the light itself strongly approximates to daylight, and is the most penetrative known.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—The largest plate-bending rolls yet seen in the district, have just been delivered at the yard of Sir James Laing, Deptford. They are nearly 40 ft. long, and the combined weight of rolls and side erections will exceed 100 tons. They will be capable of dealing with plates up to 39 ft. in length, and will be driven (it is expected) by electrical power. This is the second set of extra large rolls that has been put down at the Deptford establishment, another set of nearly equal size, having been put down towards the end of 1896. A plate "mangle" or straightening machine of unusual size and power, is expected to arrive shortly, and a planing machine 36 ft. in length, and of the latest design, is also on the way. There is a lot of other machinery to be put down at this establishment, and when all is completed there will be little to be desired in the way of equipment.

The second of the Japanese twin-screw passenger steamers, which are being built by the firm, is nearly ready for putting off the stocks, and there are one or two other vessels also in advanced stages. It is understood that among the orders in hand, are two superior type boats for firms at Havre and Marseilles.

Messrs. Short Bros. have four large vessels on the stocks, and two in the water, fitting out. The firm have also some repair contracts in hand, and are expediting contracts by overtime, and night-work in certain departments. At Messrs. Priestman's yard a high state of briskness is maintained, and at Messrs. Pickersgill's there is a large amount of work in progress. Messrs. R. Thompson & Sons, having all their berths occupied at the Southwick yard, are putting down a vessel of comparatively small dimensions at the Bridge Dock. This vessel, like all its predecessors built at the same place, will have to be launched sideways.

Messrs. Doxford have their building berths fully occupied, all the vessels on the stocks, being of exceptionally large size. It is understood that the firm is heavily booked forward; but it may be safely assumed that they have not undertaken responsibilities without the capacity to discharge them. The deliveries of material at the yard have for some time past been very heavy, and all indications point to the maintenance of a brisk state of work for many months yet.

The yards at the South Dock continue extremely busy, and the improvement works of the Wear Commissioners, which were interrupted by a sectional strike of the workmen, are again in full swing, the men having requested that the matter in dispute might be referred to arbitration.

At Messrs. Blumer & Co.'s yard there are four vessels in progress, and at the Strand Shipbuilding Co.'s establishment two vessels are on the stocks. Messrs. Austin have three vessels building, and one in the graving dock undergoing extensive repairs. The new pumping machinery put down in connection with the graving dock equipment is giving great satisfaction, expediting in a remarkable manner the docking and undocking of ships. From the owner's, as well as from the repairer's point of view, this is a most important consideration, and dock proprietors who, in a mistaken spirit of economy, adhere to antiquated methods for filling and emptying their graving docks will find they are pursuing a policy which must inevitably lead to loss of business.

Messrs. J. L. Thompson & Sons have a full share of work in progress, not to speak of that in reserve, which must be considerable. It is probable that at a time when work is so abundant as at present, firms of the standing of the one now referred to may feel called upon to accept more orders than they might have cared to undertake in ordinary circumstances, and without pretending to any special knowledge of the subject, we may, perhaps, be forgiven if we arrive at the conclusion that very few firms have a larger number of prospective contract engagements than that which rules the great establishment at the North Sands.

Engineering.—Great activity continues to exist in all departments of the Palmer's Hill works, and night-shifts are maintained throughout. The demand for Dickinson's patent crank-shaft is brisker, if anything, than at an earlier period of the year, and orders are being fulfilled daily. In addition to the new work in hand, there are, it is understood, three old vessels coming to the works to get their engines and boilers overhauled, and this, of course, will further emphasise the activity.

Messrs. George Clark, Limited, have several vessels of superior types to engine, and most of them are to be fitted with the new tail-shaft appliance, Cedervall's protective box. Messrs. Doxford's engineering department is as busy as possible, and at the North-Eastern works the machinery is kept going night and day.

Messrs. Wm. Allan & Co.'s establishment cannot be omitted from the ultra-active list, as there are more orders in hand than can conveniently be dealt with.

At Messrs. MacColl & Pollock's works, Wreath Quay, an order has just been placed for the engining of five steam barges to be employed in the navigation of the Manchester Ship Canal. One of these sets of engines is to be triple-expansion, and the remaining four of the compound surface-condensing type. The firm have engined seven boats this year (one of them a twin-screw), and are likely to double that number before the year closes. Extensions are now contemplated, and as soon as the firm succeeds in obtaining the necessary ground, building work will be commenced. Several new machines, it may be added, have been put down in the works lately.

Messrs. John Lynn & Co. are well supplied with orders for steam-steering gears, steam winches, and other specialities. In the iron-founding department business is also brisk.

The Bloomfield Engine Works (Mr. A. A. Rickaby) are also kept exceedingly busy, the demand for packings, pistons, and other engineering specialities manufactured at the works being exceptionally brisk. Ironworks are kept steadily going, and the whole of the forges are busy. At Forster's Anchor Works, Pallion, business is as active as could be wished, and the output is larger than at any former time. Coppersmiths and brass finishers are having as much work as they can deal with.

The Hartlepools.—Shipbuilding is still very active, and many of the vessels in progress are of exceptionally large tonnage. There is also a large amount of repair work in the port. Messrs. Richardson's engineering works continue working overtime and night-shifts in most departments, and the forges and foundries connected with the works are equally busy. The firm have orders for the engining of vessels building, not only at the Hartlepools, but also on the Tyne, Wear, and Tees. At the Central Marine Engine Works business is also brisk. The local steel works are kept going full time, and at the docks there is now considerable stir through the numerous arrivals of timber-laden vessels.

Stockton.—There is no falling off from the briskness formerly reported in shipbuilding, and in the marine engine works the activity is fully sustained. Boiler-works are scarcely able to deal with all the orders offered, and in bridge building works a condition of the fullest prosperity exists, as is shown by the satisfactory dividend just declared by Messrs. Wrightson & Head, as the result of the year's working.

Middlesbro'.—Messrs. Sir Raylton Dixon & Co. have one or two orders for vessels of a good class, and are said to be putting down one on yard account. Messrs. Craggs & Sons are understood to have booked a number of barges, and at Messrs. Harkess & Sons there is a fair amount of repair work in hand. Engineering establishments maintain a good show of work, and foundries have as much work in hand as they can conveniently deal with. Steel works are kept fully going, and at the docks business is beginning to brighten, the cause being, doubtless, the same as at the Hartlepools, *i.e.*, the opening of the timber-importing season.

Darlington.—At the Darlington Forge Co.'s works, orders for both forged and cast steel stern frames, rudders, &c., continue to be plentiful, and a large weekly output of work is maintained.

THE MERSEY.

(*From our own Correspondent.*)

THE course of trade throughout all branches of marine and general engineering, and also as regards shipbuilding, in this immediate district, continues in every way satisfactory. Exceptional activity is maintained in practically every department, and engineering firms are mostly so pressed with orders they have already in hand that they are in most cases unable to entertain new work offering where early delivery is necessary, which in most cases appears to be an essential requirement. This pressure of work is of course placing engineering firms in a strong position with regard to the prices they are now able to quote upon any new orders coming forward, and for some time past there has been a steady hardening up in this respect.

The usual monthly returns issued by the principal engineering trade unions fully confirm what I have already stated as to the exceptional briskness which at present prevails throughout the above branch of industry. With regard to the Amalgamated Society of Engineers, although this organisation has scarcely fully recovered from the effects of the recent dispute, the number of out-of-work members has shown a further reduction, and is now very little above the average, there being less than 3 1-3rd per cent. of the total membership on out-of-work support. as against 4 per cent. last month. In the Manchester district a reduction is also recorded, but the proportion of unemployed is still considerably above that for the society generally, representing 4¾ per cent. of the local membership. The Steam Engine Makers' Society is in a very satisfactory position as regards its unemployed list, only 1 per cent. of the total membership being now on donation, which is practically the same percentage as was recorded just prior to the commencement of the recent lock-out and strike. So far as the Manchester district is concerned, the position of this union presents a striking contrast to the Amalgamated Society of Engineers, as there are practically no local members of the Steam Engine Makers' Society at present receiving donation benefit. The reports as to trade continue of a most favourable character, with respect to both land and marine work, and activity for some time to come is regarded as practically assured.

A well-known Liverpool firm of contractors, in their semi-annual steamship circular, state that their previous anticipations of improvement in this branch of trade have been more than amply verified. This had been greatly assisted by the delay in completing the tonnage on the stocks, in consequence of the recent great engineering strike, and also by the war now existing between America and Spain, but they felt convinced that should even this war come to an early conclusion, there would yet be ample employment of a profitable nature for all the steam-shipping afloat for some time to come. So far this had been a record year. Shipbuilders and engineers had, with few exceptions, booked plenty of orders, mostly of a profitable nature, whilst shipowners had had freights higher than had ruled for years past, and if rates were not now so firm as they had been, fluctuations were only natural, and in the autumn they looked forward to a still further improvement, and they might say, even for still greater surprises, if, as was not unlikely, other political complications should arise, a probability which seemed to have been overlooked by most of those interested in shipping, among the turmoil of present excitement.

The well-known engineering concern of Hulse & Co., Ordsal Works, Salford, has, since the death of Mr. J. W. Hulse, who succeeded his father as head of the firm, been formed into a private limited Co., under the name of Hulse & Co.i Limited. Mr. Henry Bates, who has been closely associated with the management of the late firm's business for many years, is the managing-director, and Mr. Edwin Adams, a director of the new company. We understand that Messrs. Hulse & Co., Limited, are starting operations under the new conditions in an exceptionally satisfactory position, their shops having never before been so full of work. Amongst the special work in hand is a large double-duplex patent twin-screw shafting lathe, with bed about 97 ft. long, and which is fitted with two fast and two movable head-stocks, and three sliding carriages, each with duplex rests, The weight of the lathe is about 150 tons, and it s capable of removing 30 cwts. of cuttings per hour. In addition, the Company have about six other of their large patent twin-screw lathes of various sizes in progress. Other heavy work includes a number of massive planing and drilling machines for dealing with stern frames, and a large number of vertical lathes of various sizes, whilst as usual, the company have a number of their patent vertical and horizontal milling machines in progress, vertical and horizontal, both of the planer and ordinary types. A special machine which is now being completed is a large locomotive-frame plate-drilling and slotting machine, with four cross slides, each carrying a drilling and a slotting head, the bed of which is about 44 ft. long, whilst the total weight of the machine is about 50 tons. A number of special orders are also in hand for ordnance work, including boring machines for rough and finish boring tubes and hoops, and gun-turning lathes, for guns up to 10 in. calibre, and the company are making several complete plants for machining the elements of Belleville boilers and economisers, whilst in addition they have in hand a large number of their patent horizontal side-planing machines, for planing from 12 in. up to 40 in. in width.

During the past month somewhat of a lull has come over business in the iron trade of this district. The general position of the market, however, apart from a general downward move in warrants, which is largely of a speculative character, and does not affect makers, remains strong. With regard to local and district brands, makers are, as a rule, so well sold, that for the present they are rather indifferent about further business, and although the special prices which some of them have been quoting are now out of the market, they are all very firm at full list rates. Delivered Manchester, Lancashire brands are quoted 47s. 6d. for forge to 49s. 6d. for foundry, less 2½; Lincolnshire 43s. 6d. and 44s. for forge, to 46s, and 46s. 6d. for foundry, and Derbyshire foundry 50s. to 51s. net cash, delivered Manchester. There has been some easing down in the open market in Scotch and Middlesborough iron, owing to the fluctuations in warrants, but makers have not given way to any really quotable extent. Middlesborough ranges from 48s. 4d. and 48s. 7d., to 49s. 4d. net, delivered by rail Manchester. Glengarnock now averages about 49s. 6d. to 49s. 9d., and Eglinton 50s. to 50s. 3d. net prompt cash. Ordinary foundry brands of American pig-iron, are quoted 47s. 6d. at the docks, but scarcely find buyers at this figure.

In the finished iron trade, bar workers are well booked, but prices remain without really quotable change, Lancashire qualities being firm at £5 15s. to £5 17s. 6d., and North Staffordshire £6 to £6 2s. 6d. Sheets are only in limited request, with £6 17s. 6d. to £7 2s. 6d., representing the full average figures. Hoops also meet with not more than a moderate demand, but association list rates are unaltered, at £6 10s. for random, to £6 15s. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

The steel trade maintains the strong position recently reported, and in most departments, prices have shown a further hardening. Foundry hematites range from 59s. 6d. to 62s., less 2½ according to quality. Local billets have been put up to £4 10s net cash. Steel bars are quoted from £6 and £6 2s. 6d. up to £6 7s. 6d. and £6 10s. Plates have been advanced 2s. 6d. to 5s. per ton, bridge qualities being now quoted at £6 10s., with boiler plates £6 15s. to £6 17s. 6d., delivered in this district.

In the metal market an active demand comes forward for all descriptions of manufactured goods for general and marine engineers' requirements, and makers are very busy on orders in hand. There is no change in list rates, but these are firm on the recent basis, and for delivery Manchester district brazed brass tubes average 8¼d.; common rolled brass, 6¼d.; common brass wire, 6½d.; and copper wire, 7½d. per lb.

Business in the timber trade has been quiet. Imports have been moderate, and stocks, although ample, are now reduced to more reasonable dimensions, but there is no improvement in values to report. Ocean freights have shown a downuward tendency. In East India teak, both logs and planks have come to hand more moderately; there has been a fair enquiry, and the stock, although sufficient, is somewhat diminished. Prices are unchanged, but difficult to maintain. One cargo of greenheart has arrived, and there has been a fair demand for consumption, but the stock is ample.

In the coal trade here, there has been a slackening off as regards house fire qualities, but otherwise a fair business is reported generally, wich a steady tone as regards prices. In house coals, notwithstanding the lessened demand, there is no quotable giving way on list rates, whilst contracts with merchants are onlv being accepted at advanced rates. At the pit-mouth, best Wigan Arley averages 10s. to 10s. 6d.; Pemberton four-foot and seconds Arley, 8s. 6d. to 9s., and common house coal 7s. to 7s. 6d. per ton. The lower descriptions of round coal are in good demand for iron-making, steam and general manufacturing purposes, and fully maintain late rates, averaging 6s. 6d. to 7s. at the pit. Engine fuel also meets with a fair sale, and is steady at about 3s. 3d. to 3s. 6d. for common; 3s. 9d. to 4s. 3d. for medium; and 4s. 6d. to 4s. 9d. for the best sorts at the pit-mouth. The uncertainty as to possible developments in the coal trade has tended to retard the settlement of the usual forward contracts for gas and locomotive fuel. The prolongation of the Welsh dispute—which, of course, tends to strengthen the position of colliery owners in this and other districts,—and the attitude taken up by the Miners' Federation on the wages question has necessarily induced caution on the part of local coal owners with regard to long forward contracts, and they have hesitated about committing themselves to new engagements except at a substantial advance on last year's rates. With regard to gas coal, on the contracts already placed, colliery proprietors would seem in most cases to have secured advances of about 6d., although in some instances not more than 3d., and in others the same figures as last year have been accepted. With respect to locomotive fuel the coal-owners have secured advances of 6d. to 9d. per ton over last year's prices.

The shipping trade has been very active during the month, owing probably to the unexpected prolongation of the Welsh strike, whilst there has been a good deal of business in connection with the supply of coaling stations abroad, and prices are well maintained at a fair advance on those ruling prior to the commencement of the above dispute, steam coal ranging from 8s. 3d. and 8s. 6d. to 8s. 9d. and 9s. 3d., according to quality delivered Mersey ports. The South Wales dispute is also bringing a good deal of business to the Manchester Ship Canal, especially at the Partington tips, and it is probable now that attention has been drawn to the facilities there existing, a large proportion of business for markets hitherto supplied by Welsh coal will be diverted to the Ship Canal.

BELFAST.

(*From our own Correspondent.*)

THE shipbuilding and engineering industries continue to flourish in this city, and we are pleased to report that all the shipyard are full of work, every available berth being filled with vessels in various stages of construction. Both the engine-shops and part of the boiler-shops of Messrs. Harland & Wolff, Limited, are working double-shifts, and the same remarks apply to Messrs. Workman, Clark & Co., Limited, although it is reported that in some departments sufficient men cannot be got, especially in the case of riveters. We understand that from the 21st of June the members of the Iron Shipbuilders' Society get an advance of wages 2½ per cent. on piece-rates and one shilling on time rates. This settlement, with the advance already granted, makes up the five per cent., and has been accepted by the men.

Messrs. Harland and Wolff, Limited, launched from their yard on the 4th June, the steel twin-screw steamer *Bay State*, built to the order of Messrs. George Warren & Co., Liverpool. She is intended to run in this company's trade between Liverpool and Boston. This steamer has a gross tonnage of about 7,000, and is especially built to meet the requirements of the Atlantic cattle trade, two decks having been fitted for this purpose. She has a double-bottom for water-ballast and deep tanks for either water-ballast or cargo, four masts, steam windlass, steam winches, and all the latest appliances for rapid handling of cargo. She will be lighted throughout with electric light, and will be fitted with two sets of triple-expansion engines of her builders' usual style.

The large magnificent steamer *New England*, recently launched by the above firm, is drawing near completion in the Abercorn Basin and is expected to leave this port in about a fortnight.

The s.s. *Mackinaw* is still in the hands of Messrs. Harland & Wolff, and still occupies the Hamilton Graving Dock. This vessel is receiving most extensive alterations, renewals and additions, both to hull and machinery, and will look like a new ship when finished.

Messrs. Harland & Wolff are also making great progress in the construction of the large White Star Liner *Oceanic*, and one can now form some idea of the enormous proportions of this ship when seen on the slip in comparison with others alongside. It is expected that she will be launched at no very distant date.

On June 4th Messrs. Workman, Clark & Co., Limited, launched a large steel screw steamer, which forms the sixth vessel built by this firm to the order of Messrs. J. & T. Harrison, Liverpool. This steamer has been built to the highest class at Lloyd's throughout, and as she left the ways was named the *Workman* by Miss Mabel Hughes, of Liverpool. Her dimensions are:—Length, 450 ft.; breadth, 52 ft. 6 in.; depth, 33 ft. 9 in.; with a gross tonnage of 6,200 tons.

Besides this vessel, Messrs. Workman, Clark & Co. have at their various wharves the s.s. *Indore*, the s.s. *Rippingham Grange*, and the *City of Corinth*, which are all advancing towards completion, and will shortly be ready for sea.

The s.s. *Sado Maru*, built by this same firm, and a sister ship to the s.s. *Kamakura Maru*, which left this port a short time ago, sailed from here on May 31st for the Clyde, where she underwent lengthened trials on June 8th. Everything gave entire satisfaction to all concerned, her average speed being about 14½ knots. This steamer has twin screw engines and two double-ended and two single-ended boilers, wrought at 200 lbs. pressure. She is fitted up with all the latest improvements for the working of cargo, and has a complete instalation of electric light throughout. Her owners are the Nippon Yusen Kaisha.

The s.s. *Beacon Grange*, also built and engined by Messrs. Workman, Clark & Co., and the sixth vessel constructed by them for Messrs. Houlder Bros., ran her trial trip in Belfast Lough on June 15th, the results being most satisfactory to both builders and owners. She left this port for the Clyde, where she will load coals previous to taking up her station between Great Britain and America.

We have also to note another addition to the tonnage of this port by the launch of the s.s. *Wm. M. Barclay*, by the Ailsa Shipbuilding Co., Troon, to the order of Messrs. Wm. M. Barclay & Sons, Queen's Square, for their coal trade. She is a vessel of 700 tons carrying capacity, and has been engined by Messrs. Muir & Houston, Glasgow.

All the smaller engineering works and foundries in town are also exceptionally busy. Messrs. Combe, Barbour & Combe have made large additions to their already extensive works, and are now adding new machinery for making a larger class of engines and millwright's work, for which this firm is famed.

Messrs. Victor Coates & Co. also have a good number of boilers and engines on hand, which will keep them well employed for some time to come.

It may be worth while mentioning the fact that during the past month the first of a consignment of steel plates of large dimensions have arrived from America for Messrs. Harland & Wolff, Limited. It is reported that these plates are put on quay here from 10s. to 12s. per ton cheaper than can be supplied by English makers. About 900 tons of pig-iron has also been imported direct from America, and distributed to the various foundries in town, and we believe the price paid delivered into works is 46s. to 46s. 6d. per ton. Direct importation of all kinds of machinery, &c., by means of the two fine fleets of steamers belonging to the Head Line and the Lord Line, which trade regularly between this port and the United States, is decidedly on the increase, and it is to be feared that English and Scotch makers will suffer in consequence.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow.—The shipbuilding trade maintains its activity in every branch, and there is reason to believe this briskness will last for a considerable length of time, as not only are there plenty of orders in hand, but many of them are to be delivered at early dates, and much push is required to get the work forward. This is particularly the case with regard to Admiralty work, orders for very large tonnage being held by local builders, and it is quite evident the sooner these orders are out of the way, others of equal importance will take their place. The launching of the largest telegraph cable steamer in the world from the yard of Messrs. Vickers, Sons & Maxim, at Barrow, will make room for the keel of one of two large ships to be put down—one for the Pacific Steam Navigation Co., one for the Admiralty, the *Hogue*, a belted cruiser, and prospects are good as well for commercial tonnage as for Admiralty work generally. It is stated that although the order for a battleship, the *Vengeance*, was only given out to the Barrow company a few months ago, the construction of the vessel has so far proceeded that she is expected to be launched this autumn. This looks scarcely possible, but it is quite true that every effort is being concentrated on completing this ship in record time, as she is not only wanted soon by the Admiralty, but her builders are naturally anxious to show what they can do in reference to smart delivery of a warship, built as this is, absolutely from their own resources. Barrow plates and frames are used, the firm's make of armour-plates are employed, and the ship will be mounted completely by Vickers' own guns. The first-class cruiser *Amphitrite* will be launched on July 5th. She has been ready for launching for some time, but the engineers' strike delayed the work on her engines, and it was not thought advisable to launch the cruiser earlier, as she would be delayed in the dock waiting for her propelling and auxiliary engines for some time. Her boilers are all ready and her engines are now ready to remove from the shops to the ship. The work of completing her for service will not be long delayed, and if, when she is completed, she gives as good an account of herself as her sister-ship, the *Niobe*, has done, the Barrow company will have reason to feel proud. The *Niobe* has beaten all records of minimum coal consumption and in all other tests, and she went through her trials from beginning to end without a single hitch. Her engines are now being opened up, and if all is then as satisfactory as there is reason to believe it will be found, the company's will return home and leave with the Admiralty one of the best ships ever built for the defence of the Empire or the protection of her commerce. The work of plating the two 7,000-ton Clan Line turret ships, building at Barrow, has been commenced, and it is expected at least one of them will be launched in a couple of months, as her ways are likely to be required for another big ship. The two British and African steamers are being rapidly proceeded with. The keels of both have been already laid, and one of them is about to be framed. In the engineering department there is considerable briskness, and overtime is still being worked, as well as in the fitting shops, the boiler shops and foundries. The next job to be finished will be the *Duke of Cornwall*, the Fleetwood and Belfast steamer, which is to go on her service in July. She will be one of the smartest Channel steamers ever built, either as regards speed or general condition of outfit. The *Clan McGregor*, a Clan Liner that has been tripled and generally improved, will be completed next month, and then a sister-ship will come to Barrow for similar overhaul. The extensions going on at the works or Messrs. Vickers, Sons & Maxim, are of considerable magnitude, and will enable the company to largely augment its output of work. They will, in fact, undertake a new class of work in the construction of gun-mountings, for which purpose very valuable machinery has been ordered.

Shipbuilding Material.—There is a very brisk demand for all classes of ship-building material, and local makers are exceedingly busy on a very large number or orders. Much more work is being offered to makers at present than they can possibly undertake both for heavy and light plates, and other material. Plates are very firm at £6 a ton, while angles are at £5 15s. Some works in West Cumberland contemplate entering upon the mild steel trade, and will put down a plant for the production of plates, and other etceteras required in ship construction.

West Cumberland.—The shipbuilding trade at Maryport and Workington is very busily employed, and is likely to remain so, as new orders are now easily obtained.

Hematites.—The hematite trade is very briskly employed, and the demand for Bessemer descriptions remain very active. Prices are steady at 51s. 6d. to 52s. 6d. per ton net f.o.b. for mixed Bessemer iron, while warrant iron is at 50s. 2d. net cash sellers, 50s. 2d. buyers. Stocks have been reduced this year by 21,301 tons, and still remain at 163,149 tons.

Shipping.—The shipping trade is very brisk, and exports continue large, as well of pig-iron as of steel. The total shipments this year have reached 262,773 tons of steel, and 235,589 tons of pig-iron, as compared with 211,872 tons of steel, and 213,717 tons of pig-iron in the corresponding period of last year, showing an increase of 21,872 tons of pig-iron, and 50,901 tons of steel.

Steamship Circular.—Messrs. H. E. Moss & Co. in their last semi-annual Steamship Circular, stated that after so many years of pessimistic opinions, the prospects of steam shipping were more hopeful and healthier than they had been for years past, and what was of more importance, the improvement was likely to continue. They are happy to say that this prediction has been more than amply verified, even though it has been greatly assisted by the delay in completing the tonnage on the stocks, in consequence of the recent great engineering strike, and also by the war now existing between America and Spain, but they feel convinced that, should even this come to an early conclusion, there would yet be ample employment of a profitable nature for all the steam shipping afloat for some time to come. The opening up of China, and the great expansion of trade which is therefore sure to take place with that country, not only giving constant employment to steamers of large tonnage from Europe, but creating a large demand for vessels of moderate size and light draught for river navigation; the repeal of the duties on shipping for ten years by the Russian Government; the probable granting of the half-premium on navigation by the French Government; the gradual displacement of sailing ships by steam; combined with the large amount of cereals that must be moved from one part of the world to another through the short crops principally in European countries, all tend to convince them that their prognostications with regard to the future for some time are likely to be correct. Prices for building have advanced considerably during the last twelve months, in many cases from 10 to 15 per cent., moreover they do not see any likelihood of an early reduction, in view of the great amount of tonnage that is on order and the large contracts for war-vessels that are already placed and about to be made by our own Government and those of other countries. They must therefore look forward to an improved value in shipping for some time to come. Both new and second-hand steamers have found ready buyers, and prices are much higher than they have been for years past. The demand is still great, and likely to continue so, especially for vessels of handy size, of which so few have recently been built. A vast amount of tonnage, both new and second-hand, has recently been sold, and large profits have been realised by those who contracted some time ago for new steamers, or bought second-hand ones. A sign of the times is to be seen in the large increase in the size of steamers, and many of from 8,000 to 12,000 tons deadweight are in course of construction or now afloat. These vessels, as time rolls on, are sure to displace the smaller ones, for which other trades will have to be found. So far, this has been a record year. Shipbuilders and engineers have, with few exceptions, booked plenty of orders, mostly of a profitable nature, while shipowners have had freights higher than have ruled for years past, and if rates are not now so firm as they have been, fluctuations are only natural, and in the autumn they look forward to a still further improvement, and they may say even for still greater surprises, if, as is not unlikely, other political complications should arise; a probability which seems to have been overlooked by most of the shipping interest among the turmoil of present excitement.

Board of Trade Surveyors.—At the recent competitive examination of candidates for appointment as Engineer Surveyor to the Board of Trade there were 12 competitors for three places. We are informed that *two* out of these *three* appointments have been gained by students from Leask's Marine Academy. From this result it would appear that the old established academy referred to, not only maintains, but increases its reputation.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—ENGLISH.

Brisk.—On May 2nd Messrs. Edwards Brothers launched at North Shields the iron steam ketch *Brisk*, of about 160 tons, for the Pelham Steam Fishing Co., Grimsby.

Waago.—On May 2nd Messrs. Edwards Brothers launched at North Shields the iron steam ketch *Waago*, of about 160 tons, for the White Star Steam Fishing Co., Grimsby.

Ella.—On May 5th the Sunderland Shipbuilding Co. launched at Sunderland the steel steamer *Ella*, of about 1,457 tons.

Naval Prince.—On May 5th there was launched at South Shields, for Mr. W. H. Storey, of North Shields, a steel steam trawler of about 120 tons gross, named the *Naval Prince*.

Jaboo.—On May 6th there was launched at Maryport for the Liverpool Steam Fishing Co., Limited, Liverpool, a steel steam smack of about 165 tons gross, named the *Jaboo*.

Helvetia.—On May 19th there was launched at Hull for the Great Grimsby and East Coast Steam Fishing Co., Limited, Grimsby, an iron steam ketch of about 160 tons gross, named the *Helvetia*.

Wagner.—On May 23rd there was launched at Sunderland for Messrs. Jenneson, Taylor & Co., Sunderland, a schooner-rigged steel steamer of about 3,489 tons gross, named the *Wagner*.

Dart.—On Wednesday, May 25th, this vessel was launched by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, and is built to the order of the Mercantile Steamship Co., Limited, of London, and is the tenth vessel built by this firm for these owners. The vessel is built on the awning-deck rules, her principal dimensions being:—Length, 338 ft.; breadth, 44 ft. 6in.; and depth, moulded, 22 ft. 2 in. The engines and boilers are being constructed by Messrs. Thomas Richardson & Sons, Limited, of Hartlepool. The vessel was gracefully christened and launched by hydraulic power by Mrs. Rennoldson, of Ingleside, Westoe, South Shields.

Roseneath.—On May 28th Messrs. J. G. Fay & Co. launched at Woolston Yard the steam yacht *Roseneath*, of 186 tons yacht measurement, which has been built for the Earl of Cavan. The dimensions of the vessel are:—Length, identification, 131 ft. 6 in.; length, between perpendiculars, 124 ft. 7 in.; extreme breadth, 17 ft. 6 in.; moulded depth, 10 ft. 6 in. The engines are of the triple-expansion inverted surface-condensing type, the cylinders being $10\frac{1}{2}$ in., $17\frac{1}{2}$ in, and 29 in. diameter by 21 in. stroke. The yacht and machinery have been built to Lloyd's highest class, under special survey.

Blanefield.—On June 3rd Messrs. Short Brothers launched at Sunderland a vessel for the Seafield Shipping Co., Limited, of London, of which Messrs. Lawther, Latta & Co., are the managers. The vessel has been built of steel under special survey to the highest class in Lloyd's Register, and is of the following dimensions, viz.:—Length, 352 ft.; breadth, 45 ft.; depth, moulded, 27 ft. 9 in.; the carrying capacity being 5,800 tons deadweight. Special attention has been given to the arrangement of upper and main decks so as to enable a large number of cattle to be carried, suitable ventilation, &c., being fitted. The vessel will be supplied with triple-expansion engines by Messrs. George Clark, Limited, of Sunderland, having cylinders $24\frac{1}{2}$ in., 40 in., and 66 in. diameter, with a stroke of 45 in., steam being supplied by two large steel boilers working at 180 lbs. pressure. On leaving the ways the vessel was named *Blanefield* by Mrs. Short, of Ashbrooke Hall.

Philæ.—On June 4th there was launched at Sunderland by Messrs. John Blumer & Co., the screw steamer *Philæ*, built for the Moss Steam Shipping Co., of Liverpool; managers, Messrs. James Moss & Co. The vessel is to take the highest class at Lloyd's, and is of the following dimensions:—Length, between perpendiculars, 319 ft. 6 in.; breadth, extreme, 46 ft.; depth, moulded, 23 ft. 6 in. The engines and boilers are being built by the North-Eastern Marine Engineering Co., of Sunderland, having cylinders $23\frac{1}{2}$ in., 38 in., and 62 in., with a stroke of 42 in.

Trekieve.—On June 4th there was launched by Messrs. John Readhead & Sons, at West Docks, South Shields, a steel screw steamer of the following dimensions:—Length, 323 ft.; breadth, 47 ft.; and depth, moulded, 25 ft. The vessel is of the improved single-deck type, with full poop, long bridge amidships, and topgallant forecastle. Her engines, also built by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 24 in., 40 in. and 64 in. diameter by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The steamer has been built to the order of Messrs. E. Hain & Son, St. Ives, Cornwall, and was named the *Trekieve* by Mrs. Fred. M. Hertz, West Didsbury.

Ultonia. On June 4th there was launched from the East Yard of Messrs. C. S. Swan & Hunter, Limited, a large twin-screw cattle and cargo steamer which has been built for the Cunard Steam Shipping Co., of Liverpool, for their Boston service. This vessel is the largest that has yet been built on the north-east coast, being of the following dimensions:—Length overall, 513 ft.; beam ex beam, 57 ft. 4 in.; and depth, moulded, to shelter deck, 44 ft. $11\frac{1}{2}$ in. The vessel has been built to the requirements of Lloyd's three-deck rule to take their highest class, and is specially strengthened in parts beyond their rules. She has a shelter deck all fore-and-aft over which is a long bridge 140 ft. in length, both being fitted with the latest designs of stalls for the carriage of a large number of cattle. The whole of the space in the lower 'tween-decks forward has been insulated to carry chilled beef, three large refrigerating machines being placed at the fore-end of the bridge. These machines are on the latest ammonia principle and are being fitted—together with the insulation—by the Liverpool Refrigerating Co. The officers, engineers, and petty officers, are accommodated in a large deck-house round the engine casing on top of the bridge, above which is a large deck-house containing captain's room, chart room and wheel house. The crew are berthed forward in the forecastle and a number of cattlemen in the poop. The vessel is rigged as a four-masted fore-and-aft schooner and will have a large number of powerful winches and derricks for rapid loading and discharging. The engines are of the twin-screw triple-expansion type and built by Messrs. Sir Christopher Furness, Westgarth, & Co., Limited, of Middlesborough, the cylinders being $23\frac{1}{4}$ in. $38\frac{1}{2}$ in. and 68 in. diameter, with a stroke of 48 in. The boilers are five in number, single-ended, 14 ft. $4\frac{1}{2}$ in. diameter by 12 ft. long, each having three furnaces. These engines are expected to give the vessel a speed of 13 knots in the Atlantic when the vessel is fully loaded with a cargo of 11,000 tons. As the vessel was leaving the ways she was named the *Ultonia* by Lady Forwood, the wife of one of the directors of the Cunard Co. The launch was witnessed by a large company of visitors, amongst whom were Sir William Forwood, Director of the Cunard Co., Lady Forwood, Captain Watson, Mr. J. Bain, Mr. T. H. Bainbridge, Mr. W. Denton, Colonel Price, Mr. C. S. Swan, and others.

Taunton.—On Monday, June 6th, Messrs. Furness, Withy & Co., Limited, launched from their Middleton Shipyard, Hartlepool, a large steel screw steamer of handsome design to the order of Messrs. The Commercial Steamship Co., Limited, London. She is a fine type of a modern cargo-boat, measuring over 350 ft. in length, and built throughout of Siemen's-Martin steel, with large measurement and deadweight carrying capacity of about 6,250 tons, built to Lloyd's 100 A.1. class. The vessel is of the single-deck type, with poop, bridge, and forecastle. The holds are fitted with iron grain divisions, and all deck erections, skylights, bulwarks, etc., are constructed of steel and iron; cellular double bottom, fitted fore-and-aft for water ballast, the after-peak being also available as a tank. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Six large powerful steam winches, donkey-boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse pipes, and other modern appliances are fitted for the handy working of the ship. The saloon and cabin providing accommodation for the captain, etc., is handsomely finished in polished hardwood. The vessel will be rigged as a two-masted fore-and-aft schooner, and will be fitted with triple-expansion engines, with every provision for economical working by Messrs. Blair & Co., Limited, Stockton-on-Tees. The vessel has been constructed under the superintendence of Mr. E. T. Jones on behalf of the owners. On leaving the ways she was gracefully christened *Taunton* by Miss Mabel Vick, youngest daughter of R. W. Vick, Esq., J. P., a director of Furness, Withy & Co., Limited.

Manchester City.—On Monday, June 6th, there was launched from the shipbuilding yard of Sir Raylton Dixon & Co., Limited, Middlesbro', the fine Atlantic steamer *Manchester City* for the Manchester Liners, Limited, of which Sir Christopher Furness is chairman. This important company has recently been formed to run a line of cargo steamers direct from Manchester to Canadian ports, of which steamers this is the first one launched. Her particulars are as follows:—Length overall, 461 ft. by 52 ft. beam and 41 ft. deep to upper deck, carrying a deadweight cargo of 8,600 tons, and with a total measurement capacity of 14,500 tons. She has an exceptionally large quantity of water ballast in double bottom, and larger chamber abaft the engines. She is built to Lloyd's highest class three-deck rule, with shelter deck, and to Board of Trade and American emigrant requirements, being specially intended for the Canadian live cattle trade. She has a complete shade deck fore-and-aft, and large gangway doors in 'tween deck. At present she will be fitted for 700 cattle, and complete accommodation for the attendants. Very efficient ventilation is provided, and electric lighting throughout. Above the shade deck amidships is a long bridge with saloon and cabins for the officers and engineers, and above this again the captain's cabin, and wheel house. The steam steering gear is in house on deck aft, and a look-out bridge is erected at the fore end of the vessel. Her four masts are arranged for the passage of the bridges of the Manchester Ship Canal, and large powerful derrick posts are fitted for part of the twelve steam winches with which she is fitted. Accommodation is provided for seamen and petty officers in forecastle. Her triple-expansion engines of about 4,000 I.H.P., are by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, of Middlesbro', and have cylinders 30 in., 50 in., and 83 in. diameter by 54 in. stroke, with four single-ended boilers 14 ft. 4½ in. diameter by 12 ft. long, 200 lb. pressure, and fitted with Howden's forced draught. The propeller will be of manganese bronze, and her shafting very much above Lloyd's requirements and of special manufacture to avoid any risk of fracture, which has been so disastrous recently in the case of many large steamers in the north Atlantic trade. Her auxiliary machinery is of the most recent and complete description. These engines, it is estimated, will give her a speed of over 12½ to 13 knots at sea. The *Manchester City* is being built under the direction of Mr. Arthur Walker, superintendent for Messrs. Furness, Withy & Co. The launch was remarkably successful, and afforded much satisfaction to her builders, owners, and a large number of visitors who were present. On leaving the ways she was christened the *Manchester City* by Miss Raylton Dixon.

Euston.—On Monday, June 6th, Messrs. Ropner & Son launched at Stockton-on-Tees a fine steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 320 ft.; breadth, extreme, 44 ft.; depth, moulded, 24 ft. 3 in. The steamer has been built to the order of Messrs. Evan, Thomas Radcliffe & Co., Cardiff, and is of the three-decked rule, with full poop, bridge, and topgallant forecastle. The saloon and cabins for captain and officers will be fitted up in the poop, the accommodation for engineers and apprentices will be provided in the iron houses on the bridge deck, and the crew will be berthed in the forecastle as usual. She has double-bottom on the cellular principle for water ballast; and will carry about 4,400 tons deadweight on Lloyd's freeboard, on a light draught of water; she will have all the most recent appliances for the expeditious and economical loading and unloading of cargoes. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited, having cylinders 22½ in., 37 in., and 61 in. by 42 in. stroke; two steel boilers, 14 ft. 9 in. by 10 ft., 160 lbs. working-pressure. The christening ceremony was gracefully performed by Mrs. R. Ropner, junr., of Hartburn, who gave her the name of *Euston*.

Joseph Merryweather.—On Monday, June 6th, Messrs. Wm. Gray & Co., Limited, launched the fine steel screw steamer *Joseph Merryweather*, built to the order of W. S. Merryweather, Esq., of Hartlepool. The vessel will take Lloyd's highest class, and her dimensions are:—Length overall, 300 ft.; breadth, 42 ft., and depth, 21 ft. 9 in. The deck erections consist of a poop, bridge, and forecastle. A handsome saloon and cabins for officers are fitted up aft; the engineers' rooms are in the bridge, and the crew's accommodation forward. The hull is built on the deep bulb angle-frame system, with a cellular double-bottom, aft peak tank, 4 steam winches, steam steering gear amidships, hand-screw gear aft, large donkey boiler, steam windlass, boats on beams overhead, grain divisions, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply fine triple-expansion engines of 1,000 H.P., having cylinders 21½ in., 35 in. and 58 in. diameter, with a 39 in. piston stroke, and two large steel boilers to work at 160 lbs. pressure per square inch. The vessel is being built under the superintendence of Mr. John Black on behalf of the owners, and the ceremony of christening the steamer *Joseph Merryweather* was gracefully performed by Mrs. W. S. Merryweather, wife of the owner.

Sergei Witte.—On Tuesday, June 7th, Messrs. Wigham Richardson & Co. launched a yacht-like steel screw passenger steamer, which they are building to the order of the Archangel-Moorman Steam Navigation Co., of St. Petersburg. As the vessel left the ways she was named the *Sergei Witte*, the ceremony being gracefully performed by Miss Thorpe, of Kingston-on-Thames. The steamer is about 200 ft. long, and will be fitted with engines of Messrs. Wigham Richardson & Co.'s own make, designed to propel her at a good speed. The vessel has a cut-water stem with a finely-carved figure-head, which is a portrait of Mr. Witte, the Russian Minister of Finance, in honour of whom the vessel is named. She will be rigged as a two-masted schooner, and will have very luxurious accommodation for about 12 first-class and 20 second-class passengers, besides a large number of steerage passengers, and is intended to develop the trade of the White Sea, Arctic Ocean, and also of the Kara Sea and the vast resources of the Obi and Yenesei valleys. Mr. Witte has long been honourably known as one of the most patriotic and far-sighted of Russian statesmen, to whose wide views and ceaseless perseverance the great Trans-Siberian Railway itself, as well as the recent enlightened modifications of the customs, are both largely due. A goodly company witnessed the launch, including Mr. Alliman, the representative in England of the owners.

Viceroy and Halcyon.—On June 8th Messrs. Cochrane & Cooper, Limited, launched from their Grovehill Shipyard, Beverley, two fishing vessels, one a line-fishing steamer of the following dimensions, 114 ft. by 21 ft. by 11 ft. 9 in. depth of hold, built to the order of the Atlas Steam Fishing Co., Limited, Grimsby. Engines of the triple-expansion type are being supplied by Messrs. Amos & Smith, Hull. Miss Norah Buckley, of Grimsby, named the vessel the *Viceroy*. The other, a steam trawler, 112 ft. by 21 ft. by 11 ft. 6 in. depth of hold, an addition to the fleet of the East Coast Steam Trawling Co., Limited, Hull. The vessel will have triple-expansion engines by Messrs. Bailey & Leetham, Hull, and will be complete with all the most modern appliances for deep-sea fishing. The trawler was named the *Halcyon* by Mrs. Wm. Letten.

Trigonia.—On Wednesday, June 8th, this vessel, which is being constructed to the order of Messrs. M. Samuel & Co., of London, for the carriage of bulk oil cargo in the East, was launched by Messrs. Sir W. G. Armstrong, Whitworth & Co., Limited, from their Walker Shipyard. Like her sister ship, s.s. *Haliotis*, the *Trigonia* has been constructed under the supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, and she is 248 ft. 6 in. overall and 40 ft. moulded. As is the almost universal custom for vessels engaged in this trade, the *Trigonia* is fitted with a very complete electric light installation, and has an ample pumping plant of the duplex type, which is designed with a view to very prompt loading and discharge of her oil cargoes. The engines are of the compound surface-condensing type, having cylinders 30 in. and 63 in. with 39 in. stroke, and her two boilers are constructed for 100 lbs. working-pressure. As the vessel is intended to burn liquid fuel on her service, the bunkers have been specially designed and built to this end, but the furnace arrangements will also permit of coal fuel being used if needs be. Owing to the *Trigonia* being built on the turret-trunk system she is expected to have a larger carrying capacity in proportion to registered tonnage than should be the case if designed on the ordinary system.

Euryalus.—On June 8th Palmer's Shipbuilding and Iron Co. launched at Jarrow-on-Tyne a steel screw steamer, built to the order of Messrs. A. Currie & Co., of Melbourne. Her dimensions are 360 ft. by 43 ft. 6 in. by 26 ft. 9 in. The vessel has been built under special survey to take Lloyd's highest class, and is of the three-deck type. She will be fitted as a first-class cargo, passenger, and cattle steamer, and is designed to load about 4,850 tons deadweight on a mean draught of 22 ft. 6 in. The engines, also by the Palmer Co., are of the triple-expansion type, with cylinders 27 in., 45½ in., and 74 in. by 48 in. stroke, steam being supplied by two boilers 16 ft. in diameter by 12 ft. long, fitted with forced draught. The vessel was christened *Euryalus.*

Clifton.—On June 14th Messrs. Wood, Skinner and Co., Limited, launched from their shipbuilding yard at Bill Quay-on-Tyne, a new steel screw steamer, which has been built to the order of Mr. John Slater, timber merchant, of Newcastle-on-Tyne. The principal dimensions of the vessel are as follows:—Length, 125 ft.; breadth, 21 ft. 6 in.; depth, moulded, 10 ft. 1 in. She is rigged as a fore-and-aft schooner, and is specially designed for carrying cargoes of English timber, being fitted with all the latest improvements and appliances for facilitating rapid loading and discharging. The captain's and officers' accommodation is provided in the poop aft, the crew being berthed in the forecastle. The machinery for the vessel will be fitted by Mr. Charles Hartness, of Felling. As the vessel left the ways she was christened *Clifton* by Miss Slater, the daughter of the owner.

Lady Noble.—On June 16th Messrs. Wood, Skinner & Co., Limited, launched from their shipbuilding yard at Bill Quay-on-Tyne, a handsome new steel screw steamer, which has been built to the order of Messrs. L. S. Carr & Co., of Baltic Chambers, Newcastle-on-Tyne. The principal dimensions of the vessel are as follows, viz.:—Length, 195 ft.; breadth, 29 ft.; and depth, 14 ft. She will be rigged as a fore-and-aft schooner, and will be supplied with all the latest appliances for the rapid loading and discharging of cargo of a heavy character, which she is specially designed for carrying. The vessel has been built under special survey for Lloyd's 100 A1 classification. Water ballast is provided in the cellular double bottom all fore-and-aft. The cabins are arranged in the bridge amidships, having entrance through the chart-room above. Accommodation is provided for the engineers under the raised quarter-deck aft, and for the crew in the topgallant forecastle. The vessel will be fitted with a set of triple-expansion engines of the improved type, having cylinders of 15 in., 25 in., and 40 in. respectively, with a stroke of 27 in., steam being supplied by a large steel boiler having a working pressure of 160 lb. per square inch. The machinery has been constructed by the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne, and has also been built under Lloyd's special survey. The christening ceremony was performed by Miss Purvis, who named the vessel *Lady Noble.*

Clematis.—On Saturday, June 18th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer built to the order of Stag Line, Limited, of North Shields (Messrs. Jos. Robinson & Sons, managers), and of the following dimensions, viz.:—Length, 345 ft.; breadth, 46 ft.; depth, 27 ft. 2 in., moulded, and to class 100 A1 at Lloyd's on the spar-deck rule. This vessel has water ballast fitted right fore-and-aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including five double-cylindered steam winches, direct acting steam windlass, large donkey boiler, and steam-steering gear by Messrs. Clarke, Chapman & Co., Limited, and Hastie's screw gear aft. The engines which are to be supplied by Messrs. the North-Eastern Marine Engineering Co., Limited, are of the triple expansion type, having cylinders 23 in., 38½ in., and 64 in. by 42 in. stroke, and working at a pressure of 180 lbs. On leaving the ways the vessel was named the *Clematis* by Miss Gladys Robinson, daughter of Mr. Walter Robinson. This is the eighteenth vessel that the Tyne Iron Shipbuilding Co., Limited, have built for the above owners.

Romford.—On June 20th Messrs. Ropner and Son launched at Stockton-on-Tees a steel screw steamer to the order of Messrs. Watts, Watts & Co., of London, of the following dimensions, viz.:—Length, between perpendiculars, 325 ft.; breadth, extreme, 48 ft.; depth, moulded, 24 ft. 3 in. The steamer is of the three-decked rule, with one deck laid, full poop, long bridge, and topgallant forecastle. She has double bottom on the cellular principle, and will carry about 5,050 tons deadweight on Lloyd's freeboard. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited, having cylinders 23½ in., 35 in., and 64 in. by 42 in. stroke, and was named *Romford.*

Lewisham.—On Monday, June 20th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer, which they have built to the order of Messrs. Watts, Watts & Co., of London. She will take Lloyd's highest class, and is of the following dimensions, viz:—length, overall, 329 ft.; breadth, 47 ft.; and depth, 23 ft. 3 in. The deck erections consist of a poop, bridge over machinery space, and topgallant forecastle. A handsome saloon and cabins for officers, &c., will be fitted in the poop, the engineers' room in the bridge, and the crew's accommodation forward. The hull is built on the deep-frame principle with a cellular double bottom, large hatchways, powerful steam winches, steam steering gear amidships, hand-screw gear aft, patent donkey boiler, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two masts with schooner-rig, and a complete outfit for a first-class cargo vessel. Messrs. Blair & Co., Limited, of Stockton-on-Tees, supply triple-expansion engines, having cylinders 23 in., 38 in. and 62½ in. diameter, with a 42 in. piston stroke, and two large steel boilers, to work at a 160 lbs. pressure per square inch. The ceremony of christening the steamer *Lewisham* was gracefully performed by Mrs. J. B. Lohden, of Seaton Carew

Anglia.—On Monday, June 20th, Messrs. Vickers, Sons & Maxim, Limited, launched from their Naval Construction Works, at Barrow-in-Furness, a large four-masted, twin-screw steamship, adapted for carrying and laying submarine telegraph cables, built to the order of the Telegraph Construction and Maintenance Co., Limited. She is the largest cable steamer afloat. The principal dimensions are:—Length, between perpendiculars, 440 ft.; breadth, moulded, 54 ft.; depth, moulded to spar deck, 32 ft. 9 in. The length, overall, is 465 ft., which includes an elliptical stern, and an overhanging stem, both arranged for carrying telegraph cable sheaves. The vessel is built of steel throughout, under Lloyd's special survey and classed 100 A1 spar-deck. The hull is divided into nine watertight compartments, and has a double bottom extending all fore-and-aft, subdivided as necessary for carrying reserve feed water and ballast. On the spar deck amidships is built a large erection extending right across the ship, containing a range of commodious and elaborately furnished state-rooms, surgery, a testing-room, doctor's, engineers' and officers' cabins, bath-rooms, lavatories, and a large dining saloon, neatly panelled in oak to harmonise with the furniture which is also of oak. On this bridge erection are situated the captain's room and the telegraphic chart-room, the lifeboats are also carried at this level. Above these are the wheel house and navigating bridge, which is 28 ft. above the water level, when the vessel is fully loaded. The crew and petty officers' quarters are arranged on the main deck forward, and immediately abaft provision is made for the accommodation of the working staff in connection with the laying of cables. The combined steam windlass and capstan gear is of an approved design by Messrs. Napier, of Glasgow. The cable drums are vertical with a capstan above each, and are placed on the spar deck. The engine, cylinder, reversing gear and driving gear are placed on the main deck, and in general appearance is not unlike the windlass and capstan gear now so uniformly adopted in the Royal Navy. Enclosed in a house at the extreme after-end of the spar deck, is a combined patent steam and hand-steering gear by Messrs. Brown Brothers, of Edinburgh, which acts direct on the rudder stock and controlled from the navigating bridge amidships by Brown's patent telemotor gear. In four of the holds large circular tanks for the stowing of telegraph cables will be fitted, ranging from 44 ft. diameter to 48 ft., and from 17 ft. to 22 ft. in depth. On the main deck forward a powerful engine has been fitted for the raising of cables when in search of a break or fracture. The cable is wound in over the bow sheaves by means of a large drum fitted to the engine, led right along the deck and through one of the alley-ways of the bridge deck-house, passed round a drum fitted with a brake on the poop and over the stern sheaves, which are also used in the laying of a new cable, leads being arranged from the several tanks by means of sheave blocks and rollers. Although primarily intended to act as a cable steamer everything is so arranged that if desired she might be converted into a general cargo vessel of about 8,000 tons deadweight carrying capacity the cable tanks in the holds being portable. All modern improvements have been introduced for the rapid manipulation of cargo, nine derricks being fitted and worked by eight large winches. The vessel is lighted throughout by electricity on the double-wire system, the current being supplied by two dynamos, and she is heated throughout by steam. When completed and fully loaded it is anticipated she will have a sea-going speed of 11½ knots. The propelling machinery consists of two sets of vertical three-crank triple-expansion engines, working at a steam pressure of 195 lbs. per square inch. The cylinders are high pressure, 22 in. diameter, intermediate, 35½ in., low pressure, 61 in., each having a stroke of 48 in. Separate liners are fitted in the high pressure and intermediate cylinders. The engines are of a substantial design with cast-iron columns at the front, and condenser placed fore-and-aft, with columns cast on for supporting the cylinders at the back. The boilers are four in number, 16 ft. 4 in. mean diameter, by 10 ft 10 in. long, each boiler having four furnaces. The air and bilge pumps are worked off the crosshead of the intermediate pressure engine. The circulating pumps are two in number of the centrifugal type. The vessel is fitted with very powerful duplex pumps for pumping out the ballast tanks and bilges, and is also provided with a large general service pump for washing decks, and discharging to sanitary tanks, &c., also two evaporators capable of distilling 36 tons of water per day, and feed-water filters. To enable ordinaryr epairs to be made while at sea, an engineers' workshop is arranged in the engine-room, and is fitted with a screw cutting lathe, drilling machine, slotting machine and grindstone. All these machines are driven by steam power from one of the small donkey engines. The whole of the machinery has been constructed to the requirements of the Board of Trade and Lloyd's surveyors, and under the supervision of Mr. Crook and Mr. C. Slater, of the Telegraph Construction and Maintenance Co.

Guernsey.—On June 21st this vessel, which is the fortieth turret-deck vessel afloat, was launched from the yard of Messrs. William Doxford & Sons, Limited,of Sunderland. She is built to the order of Messrs. A. N. Hansen & Co., of Copenhagen, who are the owners of the turret-deck steamer *Norman Isles*, which was built by the same firm in 1896. The dimensions of the *Guernsey* are 365 ft. by 50 ft. by 29 ft. Deadweight capacity, 6,800 tons. Tri-compound engines, 26 in. 43 in. and 70 in. by 45 in. Two boilers 180 lbs. working-pressure, fitted with Howden's forced draught. The christening ceremony was performed by Mrs. Hans Nielson, of West Hartlepool.

Ethel.—On Tuesday afternoon, June 21st, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions:—Length overall, 300ft. breadth, extreme, 42 ft.; depth, moulded, 20 ft.; gross tonnage, 2,320 tons. This vessel which has been built to the order of Messrs Burdick & Cook, of London, will class 100 A1 on Lloyd's Register, and has been built under special survey. She is of the part-awning deck type, with half poop for captain and officers, engineers being berthed in after-end of awning deck, and crew in forecastle. A cellular double bottom and after-peak tank are fitted for water-ballast, and equipment includes five steam winches, Blake's patent vertical donkey boiler, steam windlass, steam steering gear, etc. The engines by Messrs. Blair & Co., have cylinders 23 in., 37½ in., 61½ in. by 39 in. stroke, steam being supplied by one double-ended boiler, having a working pressure of 160 lbs. The christening ceremony was performed by Miss Littleboy, of Saltburn, who named the vessel *Ethel*.

Easingwold.—On Tuesday, June 21st., Messrs. Wm. Gray & Co , Limited, launched the fine screw steamer *Easingwold*, which they have built to the order of the London and Northern Steamship Co., Limited (Messrs. Pyman Brothers, London, managers). She will take Lloyd's highest class, and her dimensionsare:—Length overall 341 ft.; breadth 48 ft. 6in.; and depth, 24 ft. The deck erections consist of a poop, bridge, and forecastle. A handsome saloon and cabins for officers, &c., are fitted up aft, the engineers' rooms are in the bridge, and the crew accommodation forward, including a bathroom for seamen and firemen. The hull is built on the deep-frame system, with a cellular double bottom, large hatchways, five steam winches, steam steering gear amidships, hand screw gear aft, two donkey boilers, patent direct steam windlass, boats on beams overhead, shifting boards throughout, stockless anchors, two telescoping masts, with fore-and-aft rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply fine triple-expansion engines of 1,200 H.P., having cylinders, 24 in., 38 in., and 64 in. diameter with a 42 in. piston stroke, and two large steel boilers to work at 170 lbs. pressure per square inch. The vessel has been built under the superintendence of Mr. W. Birchby, on behalf of the owners, and the ceremony of christening the steamer *Easingwold* was gracefully performed by Miss Dora Lawson, daughter of the secretary of the London and Northern Steamship Co., Limited.

Capricornus. — Lately there has been launched at North Shields for the Grimsby and North Sea Steam Trawling Co., a steel steam ketch, of about 178 tons gross, named the *Capricornus*.

Nellie and T. W. Mould.—Lately Messrs. R. and W. Hawthorn, Leslie & Co., Limited, have launched at Hebburn-on-Tyne two steel screw vessels for the local fish trawling service of the following dimensions:—93 ft. by 19 ft. by 10 ft. 6 in., and they are fitted with machinery having cylinders 15 in. and 31 in. by 21 in. stroke. These vessels are built to the order of Messrs. Smart, Stephenson & Mould, of North Shields. The first vessel was christened *Nellie* by Miss Nellie Stephenson, whilst Miss Mould performed the ceremony for the second, which was named *T. W. Mould*.

LAUNCHES—Scotch.

Yawata Maru.—On May 21st Messrs. R. Napier & Sons, Limited, launched at Govan, the third of three steel screw steamers of about 3,300 tons, which they have on hand for the Nipon Yusen Kaisha (Japan Mail Steamship Co). These fine steamers have been designed to meet the requirements of the company's Japan and Australian service, are built under special survey to Lloyd's highest class, and fitted in accordance with the Japanese Government rules and British Board of Trade requirements. The general dimensions are:—Length, 375 ft.; breadth, 44 ft.; depth, 27 ft. 8 in.; with a topgallant forecastle, long bridge, full poop and partial shade deck, and constructed with a cellular double bottom for water ballast. The upper decks and fittings are of teak, and the most modern description of appliances have been supplied for the efficient working of the ship and the rapid handling of cargo, including refrigerating machinery and chambers, mechanical ventilation, steam heating, and a complete installation of electric lighting, with duplicate dynamos, &c. As the vessel moved down the ways she was named the *Yawata Maru* by Mrs. A. R. Brown. After a very successful launch, the steamer was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Works.

Constantijn.—On May 23rd Messrs. Robert Duncan & Co., Limited, launched at Port Glasgow a steel screw steamer which was named *Constantijn*, built to the order of the Frederlandsche Nieuw-Guinea Handel-Maatschappij, of Amsterdam. The dimensions are:—Length, b.p., 106 ft. 8 in.; breadth, moulded, 19 ft. 6in.; depth, moulded, 10 ft. 6 in.; about 200 tons gross. The vesselwill be fitted with compound inverted direct-acting, surface-condensing screw engines, cylinders 13 in. and 26 in. by 18 in. stroke, supplied by Messrs. Ross & Duncan, Whitefield Works, Govan. Accommodation for passengers and officers is provided in alarge teak deck-house built forward of the engine and boiler casing. The vessel has been constructed to the highest class at Lloyd's, and is intended for trading in Eastern waters. After the launch the vessel was towed to Prince's Dock, Glasgow, where the machinery will be fitted on board.

Wyefield.—On May 23rd Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel screw steamer of about 2,100 tons net register tonnage, and 3,350 tons gross tonnage, and to carry 5,400 tons deadweight, for Messrs. Hickie, Borman & Co., 22, Billiter Street, London. The vessel is intended for their Eastern and general trade. The following are the principal dimensions:—Length, between perpendiculars, 330 ft.; breadth, 45 ft. 6 in.; depth, moulded to spar deck, 26 ft. 6 in. The vessel has been built to the highest class at Lloyd's on the deep-frame system, and is fitted throughout with a double cellular bottom for water ballast, the after-peak also being utilised for this. All the newest requirements for the quick loading and discharging and working of the ship have been supplied, including steam windlass, four steam winches, and six derricks, steam steering gear, &c. Shifting boards can be fitted, and the hatchways are arranged to act as feeders when carrying grain in bulk. The vessel is schooner-rigged, and the topmasts are made to telescope, so that the vessel can pass under bridges on the Manchester Canal. The machinery, which is being supplied by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system. The cylinders are 24 in , 40 in. and 65 in. diameter by 42 in. stroke, steam being supplied by two large boilers working at 180 lbs. pressure. As the vessel left the ways she was gracefully named the *Wyefield* by Mrs. John Hickie, of London.

Moskva.—On May 23rd the Clydebank Engineering and Shipbuilding Co., Limited, launched the *Moskva*, a high-speed mail and passenger steamer, which has been designed and constructed for the Russian Volunteer Fleet. In peace time the vessel is intended to maintain a regular service between the port of Odessa, in the Black Sea, and Vladivostock, in Siberia. Her length overall is 508 ft., and between perpendiculars, 470 ft.: her breadth is 58 ft.; 3 in. depth 37 ft.; and gross tonnage 7,400. There will be accommodation for 74 first-class passengers, 50 third-class passengers, and 1,536 emigrants, or troops in time of war. The *Moskva* can be converted into a powerful auxiliary cruiser, with an estimated speed of 20 knots. The ship is propelled by two sets of triple-expansion engines. The cylinders are 36½ in., 61 in. and 103 in. in diameter by 54 in. stroke. The high and intermediate pressure cylinders are fitted with piston valves having approved adjustable packing rings, while the low-pressure cylinders are fitted with treble-ported flat slide valves, with a special type of relief frame at the back to relieve them of steam pressure. Steam is supplied by 30 water-tube boilers of the Belleville type.

Otto.—On May 24th there was launched at Dundee a schooner-rigged steel steamer, named the *Otto*, for Messrs. T. Wilson, Sons & Co., Limited, of Hull.

Galtee More.—On May 24th Messrs. Wm. Denny & Brothers, of the Leven Shipyard, Dumbarton, launched the steamer *Galtee More*. The vessel is a twin-screw, and is intended for the London and North-Western Railway service from Holyhead to Greenore. She is 280 ft. long on the water line, 35 ft. moulded breadth, and 15 ft. moulded depth to the main deck. She has very fine lines, one peculiarity being the manner in which the lines of the ship are carried right out to the back of the rudder. The shafts for the twin-screws are inclosed in webs built out from the side of the ship, the ends of the shafts being supported by a "spectacle frame." She has also large bilge keels to minimise rolling. Large accommodation is provided for both saloon and steerage passengers. The first-class saloon is situated on the main deck forward of the boilers. On the port side abaft the saloon there is a large ladies' room, and adjoining this there is a suite of state-rooms reserved for ladies. On the opposite side there is a range of state-rooms reserved for gentlemen. On the lower deck there is a large sleeping saloon. The third-class accommodation is situated aft on the main and lower decks. The officers and engineers are berthed on bridge deck, and above the dining saloon there is a roomy companion, with a few special state-rooms. The vessel has two pole masts, and will be fitted with triple-expansion engines and high-pressure boilers by Messrs. Denny & Co., engineers, Dumbarton. She is fitted throughout with electric light, and she has also a complete system of mechanical ventilation driven by electric fans. She has very large accommodation for carrying cattle, which is an important feature in the Greenore trade. The launching ceremony, which was in every way successful, was performed by Miss Hare, daughter of one of the directors of the London and North-Western Railway Co., for which company the steamer has been built.

Obsidian.—On May 25th Messrs. A. Rodger & Co., Port-Glasgow, launched the steel screw steamer *Obsidian* for Mr. William Robertson, Glasgow. This steamer measures:—Length, 250 ft.; breadth, 35 ft.; depth, 18 ft. 6 in., moulded; and will carry 2,250 tons deadweight. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Glasgow. The ceremony of naming the steamer was performed by Miss Grace L. Greenaway Houston, Hanover Terrace, Partick.

Goustav Bole.—On May 26th Messrs. Wm. Simons & Co., Limited, Renfrew, launched complete from their yard the *Goustav Bole*, being the second of four powerful barge-loading dredgers which they have on order for the Russian Government. This vessel has been constructed under the inspection of, and is also classed by Bureau Veritas. It is of the following dimensions:—Length, 152 ft.; breadth, 32 ft. 6 in.; depth, 12 ft.; and is designed to dredge to 33 ft. depth of water. The main gearing for dredging the buckets and also the bucket chain is of the most powerful description for dredging hard ground, and is driven by surface-condensing engines of 500 I.H.P., fitted with two changes of speed for dredging hard and soft ground, and is connected at after end to drive the propellers. Independent steam hoisting gear is provided for manipulating the bucket-ladder, and also independent steam winches are fitted at bow and stern of the vessel for manœuvring the vessel when at work. Electric light is fitted on deck and throughout the vessel for working day and night. There are separate cabins for the officers and crew, and private cabin on deck is also provided.

King Gruffydd.—On June 2nd there was launched by Messrs. Russell & Co., at Port-Glasgow, a fine new screw steamer for the King Line, Limited, which has been built to the order of Messrs. Philipps & Co., of London, who are the managing owners. This vessel has been designed to carry 5,300 tons of deadweight cargo on a light draught, and has large accommodation for carrying cattle. She is also fitted with cargo-discharging appliances and machinery of the most modern design. The vessel took the water in fine style, and the ceremony of naming her the *King Gruffydd* was gracefully performed by Miss Cumming.

Zetland, Truro and Stirling.—On June 3rd Messrs. Mackie & Thomson launched at Govan three steam trawlers, built to the order of Messrs. Hagerup, Doughty & Co., Grimsby. The vessels, which were named the *Zetland*, *Truro* and *Stirling*, complete a fleet of 52 built for the same owners by Messrs. Mackie & Thomson, and like the others, will be supplied with engines by Messrs. Muir & Houston, Kinning Park. Each of the vessels is 160 tons register.

Juno.—On June 3rd Messrs. Robert Duncan & Co. launched at Port-Glasgow the steel screw steamer *Juno* for English owners. This steamer will carry 2,750 tons register, and the dimensions are:—Length, 260 ft.; breadth, 37½ ft.; depth, 20 ft. Messrs. Dunsmuir & Jackson, Govan, will supply triple-expansion engines of 19 in., 30½ in. and 50 in. by 36 in. stroke. The steamer will be specially constructed for the Baltic and Atlantic trades.

Nelson, Gnat and Floresco.—On June 3rd the Dundee Shipbuilders' Co., Limited, launched from Panmure Shipyard, Dundee, three steam tugs for London owners, the dimensions of the two first-mentioned being:—Length, 69 ft.; breadth, 16 ft.; depth, 8 ft. 10 in.; the last-mentioned being 67 ft. 6 in. long, 17 ft. 6 in. broad, and 8 ft. 10 in. deep. The vessels were named *Nelson*, *Gnat* and *Floresco*.

Gluyarrow.—On June 6th Mr. James Miller launched at St. Monans a fishing boat, built to the order of Mr. William Mathers (Wood), of that town. The boat is 67 ft. in length overall, with a breadth of beam of 20 ft. 6 in., and was named *Gluyarrow*.

Osiris.—On June 6th Messrs. Caird & Co., shipbuilders, Greenock, launched the twin-screw steamer *Osiris* for the Peninsular and Oriental Steam Navigation Co. The *Osiris*, which is a sister-ship to the *Isis*, built by the same firm, is of 1,800 tons gross, 300 ft. long, 37 ft. broad, and 18½ ft. deep. She will be fitted with triple-expansion engines by her builders, calculated to drive her 22 knots an hour. She is intended to accelerate the mail and passenger service between Brindisi and Port Said.

Livadia.—On June 6th Messrs. A. Rodger & Co., shipbuilders, Port-Glasgow, launched the steel screw steamer *Livadia* for the Inga Steamship Co., Limited, Copenhagen, the managing owners being Messrs. Hecksher & Son, Copenhagen. The dimensions are:—Length, 314 ft.; breadth, 44 ft.; depth, 23 ft. 3 in. moulded. The steamer registers 2,550 tons gross, and will carry 4,300 tons deadweight cargo on a light draught. Triple-expansion engines of 22½ in., 37 in., and 61 in. by 42 in. stroke will be supplied by Messrs. Hall-Brown, Buttery & Co., Glasgow. The ceremony of naming the steamer was performed by Miss Edith H. Miller, Heathfield, Eccles, Manchester.

Steam Yacht.—On June 6th the Clydebank Engineering and Shipbuilding Co., Limited, launched from their yard a handsome steam yacht, which they have built from their designs, for Mr. W. A. Donaldson, of Cochno, the chairman of the company. Her principal dimensions are:—Length, between perpendiculars, 185 ft.; length over figurehead and taffrail, 217 ft.; breadth, moulded, 26 ft. 6 in.; depth, 14 ft. 6 in. Her tonnage, by the Thames rule, is 606 tons. The vessel has a most graceful appearance, and will be fore-and-aft rigged, with two pole masts. There is a promenade deck amidships, extending the full breadth of the vessel and for about 90 ft. in length. The yacht will be lighted throughout with electricity, for which purpose a battery of accumulators has been provided, in addition to the usual dynamo and engine equipment. A powerful search-light will also be fitted on board. The usual auxiliary steam gear, consisting of steering engines, windlass, and warping capstan, has been provided for the vessel. The machinery, which is also being supplied by the builders, is of the inverted triple-expansio type, with a single-ended return-tube boiler, all of sufficient power to drive the vessel at a high rate of speed. The christening and naming ceremony was performed by Miss Evelyn Donaldson, daughter of the owner.

Camperdown.—On June 6th Messrs. R. Napier & Sons, Limited, launched from their shipyard at Govan, a steel screw steamer of about 4,400 tons deadweight for the Glasgow Shipowners Co., Limited, Messrs. Glen & Co., managers. The principal dimensions are:—Length, 310 ft.; breadth, 44 ft.; depth, moulded, 23 ft., with a full poop, long bridge, and topgallant forecastle; built on the deep-frame principle, with a cellular double bottom for water ballast, and classed 100 A1 at Lloyd's under special survey. The steamer has been designed to meet the requirements of the company's service, and is fitted with the most modern appliances for the efficient working of the ship and the rapid handling of cargo. Comfortable accommodation has been provided in the poop for the captain and officers, the engineers being berthed in the bridge-house and the crew in the forecastle. On leaving the ways the vessel was christened *Camperdown* by Mrs. R. A. Walker. After a very successful launch the steamer was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Engine Works.

Ningpo.—On June 7th Messrs. Scott & Co., Greenock, launched the steamer *Ningpo*, for the China Navigation Co. Dimensions:—Length, 275 ft.; breadth, 38 ft.; depth, 22½ ft.; of 2,100 tons gross, with a carrying capacity of 2,700 tons. Triple-expansion engines will be supplied by the builders. This is the fifth of an order for six steamers. The christening ceremony was performed by Mrs. Charles C. Scott.

Hector.—On June 7th the Irvine Shipbuilding and Engineering Co., Limited, launched the s.s. *Hector*. This vessel has been built to the order of Messrs. J. & P. Hutchison, of Glasgow, and is 165 ft. long by 26 ft. 6 in. beam by 14 ft. deep, and has a deadweight carrying capacity of 600 tons. She has a cellular double bottom and water ballast, and is fitted with powerful steam-deck machinery, steering gear, &c. She is built to Lloyd's 100 A1 class, special certificate. The vessel will be fitted with machinery constructed by Messrs. McKie & Baxter, Copland Works, Govan, which will consist of a pair of C.S.C. engines, 18 in. and 40 in. by 33 in. stroke, supplied by steam from a horizontal return tubular boiler 13 ft. 6 in. diameter by 10 ft. long, for 130 lbs. working-pressure.

Buffalo.—On June 7th Messrs. Barclay, Curle & Co., Limited, launched at Whiteinch, a twin-screw steam tug, built to the order of Messrs. Dyer & Dyer, London, for the United Boating Co., East London, South Africa, and is intended for general towing purposes. The vessel has been constructed in excess of Lloyd's requirements, and has a large fresh-water carrying capacity to supply shipping in the roadstead. Her dimensions are 110 ft. by 24 ft. by 13 ft. 6 in., and has a gross tonnage of about 260 tons. On leaving the ways the vessel was christened *Buffalo* by Miss Winifred Maclean, of Partick, Glasgow. After the launch the vessel proceeded to the crane to be filled with her engines, which are being supplied by the builders, and will develop 850 H.P.

Lady Jackson and Empress of India.—On June 7th Messrs. Carmichael, Maclean & Co., launched at Greenock two steel screw tugs, each of 250 tons gross, which they have built for Mr. Joseph Constant, London, for service in English Channel and at Dover Harbour. The dimensions of the vessel are as follows:—Length 100 ft. by 21 ft. by 12 ft., moulded to class 100 A1 at Lloyd's. Compound surface-condensing engines to be supplied by Messrs. John G. Kincaid & Co., Greenock. The ceremony of naming the first vessel *Lady Jackson* was gracefully performed by Miss Maclean, Glasgow, and the naming of the second one *Empress of India* by Miss Eaglesham, of Glasgow.

St. Blicher.—On June 8th the Grangemouth Dockyard Co. launched at Grangemouth a handsomely-modelled screw steamer, to the order of Messrs. Svendsen & Christensen, Copenhagen. The vessel has been specially designed for the Baltic timber trade, and will carry a cargo of 1,700 tons on a light draught. She is fitted with raised quarter-deck, with bridge and topgallant forecastle. As she left the ways she was gracefully named the *St. Blicher* by Mrs. Klitgaard, wife of the captain. She has been engined by Messrs. Hutson & Son, Kelvinhaugh, Glasgow.

Pinemore.—On June 9th Messrs. Charles Connell & Co. launched from their shipbuilding yard at Scotstown the steel screw steamer *Pinemore*, which they have built to the order of Messrs. W. Johnston & Co., Limited, Liverpool, for their north Atlantic trade. Her dimensions are:—459 ft. by 52 ft. by 34 ft., with shelter deck above. The engines, with large boiler power, are being fitted by Messrs. David Rowan & Son.

Eala.—On June 11th there was launched by Mr. Archibald Munro, at Ardrishaig, a beautifully designed 7-ton cruising yacht, built to the order of Colonel E. D. Malcolm, C.B., Achnamara. The yacht is built after the model of the Lochfyne fishing boats. Her fittings are of teak and pine. In her forecastle there is room for two seamen, while in her cabin there is sleeping accommodation for a party of four. As the yacht glided into the Crinan Canal she was named the *Eala* by Miss Julia B. Munro, daughter of the builder.

Stern-Wheel Steamer.—On June 14th Messrs. Ritchie, Graham & Milne launched at Whiteinch a stern-wheel steamer. Dimensions:—102 ft. long by 21 ft. beam by 3 ft. 3 in. moulded depth, constructed of galvanised steel. The vessel has been built in seven floatable sections, and is fitted with a pair of compound non-condensing engines of 130 I.H.P. by Messrs. Campbell & Calderwood, Paisley. After her trial trip the vessel will be dismantled and shipped to East Central Africa for the African Lakes Corporation, Limited, passenger service.

Vulture.—On June 14th Messrs. A. & J. Inglis launched at Pointhouse, Glasgow, the new steamer *Vulture*. The vessel is to be placed on Messrs. Burn's Royal Mail service between Scotland and Belfast.

Bolivar.—On June 18th, Messrs. Hall, Russell & Co. launched from their shipbuilding yard at Aberdeen a steel screw passenger and cargo steamer, built to the order of the Booth Iquitos Steamship Co., Limited, of which Messrs. Alfred Booth & Co., Liverpool, are managers. The dimensions of the vessel are:—Length, 232 ft.; breadth, 33 ft.; depth, 16 ft. 6 in.; and 1,000 tons gross register. She has been specially constructed for the mail service from Liverpool and the Continent to Iquitos, Peru, will class 100 A1 at Lloyd's, and have all the requirements to pass the Board of Trade for passenger certificate. The vessel, which was christened the *Bolivar*, will be fitted with a set of triple-expansion engines of the most modern type, constructed by the builders, having cylinders 17 in., 29 in. and 46 in. diameter, by 33 in. stroke, and a steel boiler with a working-pressure of 180 lb., capable of developing 800 I.H.P.

Loch Lomond.—On June 18th Messrs. A. Hall & Co. launched at Aberdeen a steel screw trawler, 110 ft. in length, 26 ft. 6 in. in width, and 11 ft. 6 in. in depth, for Messrs. A. & M. Smith, Aberdeen, Leith, and Shetland. The vessel will be fitted with triple-expansion engines of 350 I.H.P. She was named the *Loch Lomond*.

Mount Rosa and Mount Viso.—On Monday, June 20th there was launched from the yard of Messrs. Cumming & Ellis, Inverkeithing, two other trawlers for the new fleet building by them for Messrs. Muirhead's Trawlers, Limited, Granton. The dimensions of the vessels are 109½ ft. by 21 ft. by 11 ft. 9 in., and are being fitted by Messrs. Hutson & Sons, Kelvinhaugh Engine Works, Glasgow, with compound engines, having cylinders 21 in. and 42 in. by 24 in. stroke. Steam is supplied from large boilers working at 100 lbs. pressure. The vessels are fitted with all modern improvements used in connection with fishing with the new Otter gear, a double set of which has been supplied by the builders. Double-barrelled steam winches are also fitted on board each vessel. Accommodation for officers and crew is fitted aft and forward, the after accommodation being in polished hardwood and neatly upholstered, special rooms being fitted for the captain and engineers. The accommodation forward for crew and firemen is fitted in pine and tastefully grained. The vessels throughout are built of steel, 20 per cent. in excess of Lloyd's requirements, and as the vessels are intended for fleeting, the builders have kept in view the excessive strain they are subject to while at work, and have strengthened the parts most liable to be affected. The shell-plating for half the vessel's length amidship is double at the load-line, and heavy cope irons are fitted outside the doubling-plates. On leaving the ways the vessels were named *Mount Rosa* and *Mount Viso*.

Onslow.—On June 20th there was launched from the shipbuilding yard of Messrs. D. & W. Henderson & Co., Partick, a large steel screw cargo steamer, which they have constructed to the order of Messrs. Harris & Dixon, London, under the superintendence of Mr. H. M. Rogers, consulting engineer to the company. The vessel is in length, between perpendiculars, 375 ft.; breadth, 50 ft.; with a depth of 28 ft. 8 in., having a gross tonnage of about 4,400 tons, and will be classed in Lloyd's Register 100 A1, three-deck rule. She has been fitted with all the latest improvements to ensure the rapid and safe working of the large cargo which she has been designed to carry, including seven powerful winches, and also large derricks fitted at the hatches. Steam steering-gear, by Messrs. Bow, MacLachlan & Co., Paisley, is fitted amidships. The saloon and officers' accommodation is on the fore-end of the bridge-deck, and a chart-room and wheel-house have been built above this, with a bridge which will give every facility to the officers in the navigation of the vessel. A set of triple-expansion engines will be supplied and fitted by the builders, having cylinders 25 in., 41 in., and 67 in. diameter, by 4 ft. stroke. As she left the ways, the vessel was gracefully named *Onslow* by Mrs. T. W. McIntyre, 27, Athole Gardens.

W. M. Barkley.—On June 21st the Ailsa Shipbuilding Co., Troon, launched from their yard a fine steel screw steamer, built to the highest class at Lloyd's for Messrs. W. M. Barkley & Sons, Belfast. Her dimensions are:—Length overall, 185 ft. 6 in.; length, between perpendiculars, 178 ft. 6 in.; breadth, moulded, 27 ft.; depth, moulded, 13 ft. 4 in.; designed to carry 700 tons on a moderate draft. The engines are being fitted by Messrs. Muir & Houston, Limited, of Glasgow, and are of the compound surface, condensing type, the cylinders being 21 in. and 44 in. diameter, with a stroke of 30 in. As she left the ways she was gracefully named the *W. M. Barkley* by Miss Barkley, daughter of the owner.

Avon and Boyne.—On June 21st Messrs. Mackie & Thomson, Govan, launched two trawlers of 200 tons each, which they have built to the order of Messrs. James Leyman & Co., Limited, Hull. The vessels, named the *Avon* and the *Boyne*, are the first of an order for 34 which the firm has in hand for the same owners.

Ierne.—On June 22nd there was launched from the Shipbuilding yard of Messrs. Murdoch & Murray, Port Glasgow, a nicely-modelled steel screw steamer built for the coasting trade. The vessel is of the well-deck type, and is of the following dimensions;—Length, 170 ft.; breadth, 23 ft. 6 in.; depth, moulded, 15 ft. 2 in. She is built to the order of Michael Murphy, Esq., of Dublin, and is the fourth vessel built for him by the above firm. After an interesting ceremony, Father McCarthy named the new steamer *Ierne*. Compound surface-condensing engines of large power, will be supplied by Messrs. Lees, Anderson & Co., Glasgow.

John S. Boyle and Mary Bell.—Lately Messrs. Hall, Russell & Co., Limited, launched at Aberdeen two steel screw trawlers, built to the order of Mr. John S. Boyle, Glasgow. The vessels are of the following dimensions:—Length, 107 ft.; breadth, 20 ft.; depth, 11 ft. 3 in., and 143 tons gross register. Steel boiler and compound engines of 320 I.H.P. will be supplied by the builders. The trawlers were respectively named *John S. Boyle* and *Mary Bell*.

LAUNCHES—IRISH.

Bay State.—On Saturday, June 4th, Messrs. Harland & Wolff launched from Queen's Island, Belfast, the steel twin-screw steamer *Bay State*, built for Messrs. Geo. Warren & Co., Liverpool, and intended to run in the company's line between Liverpool and Boston. The new ship has a gross tonnage of 7 000, and is specially built to meet the requirements of the Atlantic cattle trade, two decks being fitted up for this purpose. She has a double bottom for water ballast and deep tanks adapted for water ballast or cargo, four masts, steam windlass, winches, and all latest appliances for rapid working of cargo, and will be lighted throughout by electric light. The vessel will be fitted with triple-expansion engines.

Workman.—On June 4th there was launched by Messrs. Workman, Clark & Co., Limited, at Belfast, a large steel screw steamer, named the *Workman*, built to the order of Messrs. T. & J. Harrison, of Liverpool. The vessel has been built to Lloyd's highest class throughout, and will be fitted with machinery also constructed by the builders. She is of the following dimensions:—Length, 450 ft.; breadth, 52 ft. 6 in.; depth, 33 ft. 9 in., with a gross tonnage of over 6,200 tons.

LAUNCH—GERMAN.

Algieba.—On May 28th the Flensburg Shipbuilding Co. launched from their yard a steel screw steamer for Messrs. Holm & Molzen, at Flensburg. The dimensions are:—281 ft. 6 in. by 39 ft. by 18 ft. 11½ in. On leaving the ways she was christened *Algieba* by Mrs. Holm.

TRIAL TRIPS.

Julius Holmblad.—On May 17th the s.s. *Julius Holmblad*, built by Messrs. William Hamilton & Co., Port-Glasgow, for Det Danske Kulkompagni, of Copenhagen, went on trial with most satisfactory results. The steamer, which has been specially built for the coal trade between Copenhagen and Grangemouth, is of the following dimensions:—Length, b.p., 250 ft.; breadth, 36 ft.; depth, moulded, 19 ft.; and is designed to carry about 2,200 tons deadweight on a light draught. The machinery, which has been supplied by Messrs. Blackwood & Gordon, of Port-Glasgow, is on the triple-expansion system, having cylinders 18 in., 29 in. and 47 in. diameter, by 33 in. stroke, steam being supplied by large boiler at 165 lbs. working pressure.

Energi.—On May 20th the new steel screw steamer *Energi*, built by the Flensburg Shipbuilding Co. for Mr. N. D. Christensen, in Marstal, made her first trial. Her dimensions are:—230 ft. by 35 ft. by 15 ft., 10¼ in. The engines of 540 H.P., also built by the Flensburg Shipbuilding Co., gave a speed of 9·9 knots.

Malaya.—On May 21st the steamship *Malaya*, built by Messrs. William Hamilton & Co., Port-Glasgow, for the East Asiatic Co., Limited, of Copenhagen, proceeded down the Clyde to undergo her trial trip. The vessel, which has been designed for the company's passenger and cargo trade between Denmark and the Far East, is 370 ft. long by 46 ft. 6 in. beam by 29 ft. moulded to upper deck, with a gross tonnage of 4,100 tons, and is capable of carrying 6,000 tons deadweight. The machinery, which has been constructed by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system, having cylinders 25 in., 42 in., and 68 in. diameter by 45 in. stroke, steam being supplied by three large boilers of 160 lbs. working-pressure. The trial was most satisfactory, the engines working smoothly all day.

Guildhall.—On May 23rd the steamer *Guildhall*, built by the Tyne Iron Shipbuilding Co., Willington Quay, to the order of Messrs. J. & E. Guthe & Co, West Hartlepool, left the Tyne for her official trial trip. Her principal dimensions are:—Length, 290 ft.; breadth, 43 ft.; depth, 22 ft. moulded, and will carry upwards of 4,000 tons on a light draught. She is fitted with all the latest improvements for the rapid loading and discharging of cargo. The engines, which have been constructed by the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne, are of their latest triple-expansion type, with cylinders 22½ in., 37 in. and 61 in. by 39 in. stroke, steam being supplied by two large steam boilers working at a pressure of 160 lbs. During the trial the engines worked smoothly and without the slightest hitch, and gave every satisfaction.

Carisbrook Castle.—On May 25th Messrs. Donald Currie & Co.'s new Royal Mail steamer, *Carisbrook Castle*, 7;626 tons register, which has just been completed by the Fairfield Shipbuilding and Engineering Co., of Govan, for the South African mail service of the Castle Line, performed a most successful series of trials on the Clyde at a mean speed of over 18½ knots on the measured mile. The *Carisbrook Castle*, which is the largest vessel in the company's fleet, is 500 ft. long overall. Her extreme breadth is 56 ft., and her moulded depth 35 ft. 6 in. The vessel will accommodate about 250 first-class passengers, 150 second-class aft, and about 220 third-class forward. The propelling machinery consists of four cylinder and four crank quadruple-expansion engines, balanced on the Yarrow-Schlick-Tweedy system. The engines are the largest of the quadruple-expansion type which have yet been constructed balanced on this system.

Monterey.—On May 25th, the *Monterey*, a finely-modelled steel screw steamer, which has been built to the order of Messrs. Elder, Dempster & Co., of Liverpool, was taken to sea for her official steam trials. Her dimensions are as follows:—Length, between perpendiculars, 445 ft.; breadth, extreme, 52 ft.; depth, moulded, 30 ft. 10 in. The vessel is rigged as a fore-and-aft schooner, four masted, and has been built under special survey to take the highest class in Lloyd's Registry. She is of the three-decked type, with two steel decks laid all fore-and-aft, and has an iron shelter deck for cattle extending over the whole length, and above this is a shade deck, covering the machinery openings. All the available space under the shelter deck, and along each side under the shade deck is arranged with fittings for carrying cattle. Accommodation for the officers and engineers is arranged under the shade deck in steel houses at each side of the engine and boiler casing, and for the seamen, firemen, and cattlemen forward. A cellular double bottom is fitted all fore-and-aft, and is arranged for carrying water ballast, and also for fresh water for supplying cattle. Water ballast is also arranged to be carried in a deep cargo tank, and in the after-peak, giving the vessel a total water ballast capacity of over 2,000 tons. The hull is subdivided into a suitable number of compartments by watertight steel bulkheads. The vessel is fitted with all the most modern appliances for the rapid loading and discharging of cargoes and for the general working of the ship. The engines, which have also been constructed by the Palmer Company, are of the inverted vertical triple-expansion type, with cylinders 30 in., 50 in., 81½ in. by 54 in. stroke, steam being supplied by three boilers 14 ft. 6 in. diameter by 17 ft. 6 in. long, with a working pressure of 180 lbs. During the trial the engines worked in a highly satisfactory manner at 68 revolutions per minute, and a mean speed of 13½ knots was attained on the measured mile.

Sanna.—On May 25th this vessel went to sea for her trial trip. She is a fine steel screw steamer built by Messrs. William Gray & Co., Limited, to the order of Messrs. J. Christensen, of Bergen, and Hans B. Olsen, of West Hartlepool. She is the second ship built by Messrs. William Gray & Co. for these gentlemen, and the fifth for Mr. Christensen. Her length overall is, 330 ft.; breadth, 47 ft.; and depth, 27 ft. 4 in., and she has been built to Lloyd's highest class. Her engines are of the triple-expansion type, having cylinders 24 in., 38 in., and 64 in. by 42 in. stroke, and have been supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Ltd. The vessel went out in the early morning, and after having her compasses adjusted, a tug boat met her in the bay at 10 o'clock with a party of visitors, amongst whom were:—Messrs. Hans B. Olsen, Guthe, J. Merryweather, W. Merryweather, R. Coverdale, Sorensen, Kirby, Foxton, Smith, Captains Watson and Blacklin. Captain Hartman was in command of the ship; Mr. Black, superintendent engineer for the owners, was there, Captain Murrell on behalf of the builders of the ship, and Mr. Lindsay representing the engine builders. The ship was now headed to the north and a run made to Blyth, which port she reached after an excellent voyage, averaging 11½ knots per hour. Everything went off without a hitch, the performance of both ship and machinery being in every way satisfactory. An excellent luncheon had been provided, to which ample justice was done. The *Sanna* loads at Blyth, and from thence proceeds to Genoa.

Tenby.—On May 26th the s.s. *Tenby*, built by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of Messrs. R. Ropner & Co., West Hartlepool, made her official trial trip in the Tees Bay, the vessel doing 11 knots and the machinery working without hitch. The steamer will carry a deadweight cargo of about 6,000 tons on a light draught; the trunk arrangement affording extra large cubical capacity for measurement cargoes. The vessel is fitted with a set of powerful triple-expansion engines by Messrs. Blair & Co., Limited, the well-known marine engineers. The *Tenby* has been built under the trunk patent, and is the twelfth steamer so built, and the third one of this type for the same owners.

Sapphire.—On Thursday, May 26th, the new steamer, *Sapphire*, which has been built for the Eastham Ferry Company by Messrs. John Jones & Sons, of Liverpool, was taken for her trial trip. The vessel, which is double-ended, is of special design in order to comply with the conditions of light draught and ferry traffic on the Mersey. The dimensions are: 140 ft. by 24 ft. by 8 ft. 6 in., the engines being compound surface-condensing, with feathering paddle wheels, steam being supplied from a large marine boiler working at 130 lbs. pressure. There are two handsome deck saloons and large promenade deck, also passenger-saloon below, and a complete installation of electric light, steam steering gear, and all the latest improvements. On the day previous the vessel was tested for draught and speed, the tests proving satisfactory, the draught with the weight of 40 tons on board being less than 4 ft., and the specified speed of 12 miles being exceeded. The vessel has been built to the satisfaction of both the British Corporation and Board of Trade, and to the designs and under the supervision of Messrs. Flannery & Tritton, of Liverpool and London.

Povena.—On May 26th this vessel went to sea for her trial trip. She is a sister ship to the *Algorta*, which vessel had her trial recently. The *Povena* has been built by Messrs. William Gray & Co., Limited, to the order of Senor Ramon de la Sota, of Bilbao. She takes Lloyd's highest class. Her length is 285 ft., overall, breadth, 41 ft. 6 in.; depth, 20 ft. 2 in. The engines are of the triple-expansion type, having cylinders 21½ in., 34 in., and 57 in. in diameter, with a piston stroke of 39 in., steam being supplied by two steel boilers working at a pressure of 160 lbs. per square inch. This vessel had a run along the coast to Redcar and back, and averaged a speed of 10½ knots. There were present Senor Luis Y. Bara, part-owner and marine superintendent, Senor Fernando Torres, engineer superintendent, Captain Divriso Beraro, who was in command, Captain Murrell, representing the builders of the ship, and Mr. Lindsay those of the engines. The engines ran with great smoothness, the bearings keeping quite cool, and the boilers perfectly tight. The vessel returned to West Hartlepool for bunkers, and proceeds thence to Bilbao in ballast.

Lord Dufferin.—On May 27th the s.s. *Lord Dufferin*, built by Palmer's Shipbuilding and Iron Co., Limited, to the order of Messrs. Thomas Dixon & Sons, of Belfast, was taken to sea for her official steam trial. Her dimensions are as follows:—Length, between perpendiculars, 400 ft.; breadth, 48 ft. 6 in.; depth, moulded, 31 ft. 6 in. The vessel is rigged as a fore-and-aft schooner and is of the three-deck type, with a poop, bridge, and topgallant forecastle, and is built to take the highest class in Lloyd's register. The upper and main decks are of steel all fore-and-aft, and the poop, bridge, and forecastle decks are of wood. The space under the bridge is left clear for cargo and bunkers, and accommodation for the captain, officers, and engineers is provided in steel deck-houses on the top of the bridge deck. The poop is fitted up for the seamen and firemen at the sides, and for the steering gear in the centre. The topgallant forecastle has steel side houses for the accommodation of petty officers, store rooms, &c., and is left open in the centre. A double bottom for water ballast is fitted all fore-and-aft. The vessel will be finished and fitted out as a first class cargo steamer and all the most modern arrangements for the rapid loading and discharging and safe carriage of grain and other cargoes, and for working the vessel will be provided complete. The vessel is designed to lift 7,100 tons deadweight on Lloyd's summer draught. The engines which are also constructed by the Palmer Co. are of the triple-expansion type, with cylinders 28 in., 46 in. and 76 in. by 51 in. stroke, steam being supplied by two boilers 15 ft. diameter by 17 ft. 6 in. long, with a working pressure of 180 lbs. During the trial the engines worked in a highly satisfactory manner at 70 revolutions per minute, and a mean speed of 13½ knots was attained on the measured mile.

Hohenfels.—On Saturday, May 28th the s.s. *Hohenfels*, which has been built by Messrs. Wigham Richardson & Co., Neptune Works, Newcastle-on-Tyne, to the order of the Deutsche Dampfschifflfahrts Gesellschaft "Hansa," of Bremen, went for a very successful trial run off the coast. The vessel carries 8,000 tons of deadweight, and has been built to take Lloyd's highest class, her decks are of teak, and she has a limited amount of passenger accommodation. Her engines and boilers, both constructed by Messrs. Wigham Richardson & Co., and the former being of the quadruple-expansion type balanced on the well-known Yarrow, Schlick and Tweedy system, worked without the slightest hitch, driving the vessel at a speed of over 12 knots. The working pressure is 210 lbs., and three single-ended boilers are arranged on the Howden forced draught system. On the trial trip the owners were represented by Mr. Wulff, their superintendent engineer, and the builders by Mr. Wigham Richardson, Mr. Tweedy, and Mr. J. Denham Christie. Immediately on the conclusion of the trial trip the vessel sailed for Hamburg under the command of Captain Lintig.

Kenilworth.—On May 31st the official cruise of the *Kenilworth* a new steamer which has been built by Messrs. A. & J. Inglis, Pointhouse, to augment the service of the North British Steam Packet Co. to and from Craigendoran and Rothesay and intermediate ports, took place in the Firth of Clyde. The cruise was not made to test the capability of the steamer. On the previous day, when the builders took her on the usual measured mile, she covered 18·6 knots per hour, the engines making 50 revolutions per minute, and developing 1,670 I.H.P. The trial was considered very satisfactory, and the speed was a fifth-of-a-knot more than was obtained from the *Talisman*. The *Kenilworth*, which brings up the Clyde fleet of the N.B. Steam Packet Co. to eight in number, is similar in dimensions to the *Talisman*. She is 215 ft.,in length, her beam is 23 ft., and she is propelled by a single diagonal surface-condensing engine. In the design of the vessel special attention has been given to speed, which seems to be an all-important consideration to excursionists. The *Kenilworth*, although of the same dimensions as the *Talisman*, has a slight advantage over her consort, in respect that in her construction minute alterations in form, disposition of weight, and details of machinery have been made. The new steamer has accommodation for 1,250 passengers.

Pollux.—On May 31st the new steamer *Pollux*, built by the Campbeltown Shipbuilding Co., and engined by Messrs. John G. Kincaid & Co., Greenock, for the Finska Steam Navigation Co., of Helsingfors, went down the Clyde on her trial trip. The machinery worked with smoothness, and a speed of about 11¼ knots on the measured mile was attained.

Hebrides.—On June 2nd the new steamer *Hebrides*, built by the Ailsa Shipbuilding Co., Troon, for Messrs. John M'Callum & Co., Glasgow, went down the Clyde on her official trial trip. The *Hebrides*, which is intended for Messrs. M'Callum's passenger traffic to the Outer Hebrides, has been built to the highest requirements of Lloyd's. Her length, between perpendiculars, is 180 ft., and overall 190 ft. She is 28 ft. in breadth, moulded; 13 ft. 10 in. in depth, moulded, and is built throughout of steel. The accommodation for first-class passengers is placed aft, and is on the most liberal scale. The vessel has accommodation for 450 passengers, and is built to carry about 600 tons of cargo, cattle also are provided for both on deck and 'tween decks. The engines are on the triple-expansion principle, and the cylinders are respectively 16 in., 26 in., and 42 in. each, with a 30 in. stroke. They have been supplied by Messrs. A. & J. Inglis, Pointhouse, indicate 800 H.P., and are intended to drive the vessel at a speed of 12½ knots. Between the Cloch and Cumbrae Lights the vessel was timed, and she did the distance in 64 minutes, representing a speed of 12·812 knots an hour.

Zola.—On Thursday, June 2nd, the s.s. *Zola*, built by the Sunderland Shipbuilding Co., Limited, to the order of Messrs. Elder, Dempster & Co., of Liverpool, was taken to sea on her official trial trip. The dimensions of the vessel are ;—Length, between perpendiculars, 356 ft. ; breadth, 45 ft. 2 in. and depth, moulded, 29 ft. 4 in. ; gross tonnage, 3,504 ; register tonnage, 2,246 ; classed 100A1 at Lloyd's ; spar-deck grade, with poop, bridge and topgallant forecastle. Accommodation for 12 first-class passengers, captain, officers and engineers is in two large houses on the bridge deck, while the sailors and firemen are berthed in the topgallant forecastle, and the cattlemen below in the 'tween-decks. The steamer is specially fitted-up for the North Atlantic cattle trade, and has a deadweight carrying capacity of 5,700 tons on Lloyd's freeboard. The machinery is by the North-Eastern Marine Engineering Co., Limited, Wallsend-on-Tyne, of the triple-expansion type, and has cylinders 24 in. 40 in. and 64 in. by 42 in. stroke. The trial was most satisfactory ; the mean of several runs upon the measured mile gave an average speed of 11½ knots, the machinery working splendidly, and everything else passed off in a most successful manner ; immediately afterwards the vessel proceeded on her voyage to Montreal. During construction the steamer has been inspected by Captain Evans, Mr. Lees, and Mr. Hall on behalf of the owners.

Yarta.—On June 2nd the fine screw steam yacht *Yarta*, just completed by Messrs. Hawthorns & Co., Limited, shipbuilders and engineers, Leith and Granton, to the order of Captain Arthur Wiggins, Sandhills, Christchurch, designed and built under the superintendence of Mr. Alfred H. Brown, London, underwent her official trials in the Firth of Forth with the most satisfactory results to all concerned. The vessel left Granton for a cruise in the Baltic on the following Saturday.

Admiral Nelson.—On June 3rd the new screw steamer *Admiral Nelson*, the first vessel built for the Admiral Nelson Steam Shipping Co., of which Messrs. Wait & Dodds, of Newcastle, are the managing owners, was taken on her official trial trip from Sunderland, where she was built by Messrs. John Blumer & Co. The *Admiral Nelson* is classed 100 A1 at Lloyds, and her deadweight capacity is 5,100 tons on a 20 ft. draught. She is fitted with triple-expansion engines by Messrs. Blair, of Stockton. Over the measured mile off Whitley the vessel steamed 11·57 knots with the wind and tide, and 10·05 knots against, her average for four trips being 10¾ knots. The trial was considered very satisfactory.

Dragoman.—On June 4th the new steamer *Dragoman*, built by Palmers' Shipbuilding and Iron Co., Limited, to the order of Messrs. The Bedouin Steam Navigation Co., Limited, of Liverpool, was taken to sea for her official steam trials. The *Dragoman* is a finely-modelled steel screw steamer of the following dimensions :—Length, between perpendiculars, 350 ft.; beam, moulded, 45 ft. ; depth, moulded, 28 ft. 6 in. The vessel has been built under special survey to class 100 A1 in Lloyd's Register, and is of the three-deck type, having a poop, bridge, and forecastle. The vessel is designed to load a deadweight of 5,700 tons on about 23 ft. mean draught. The engines, which have also been constructed by the Palmer Co., are of the triple-expansion surface-condensing type, with cylinders 24 in., 40 in., and 64 in. by 45 in. stroke, steam being supplied by two boilers 16 ft. in diameter by 11 ft. long, with a working pressure of 180 lbs. During the trial the engines worked in a satisfactory manner at 63 revolutions per minute, and a mean speed of about 9½ knots was attained on the measured mile.

Helena.—On June 4th the s.s. *Helena*, recently built by Messrs. G. Rennie & Co., of Greenwich Iron Shipbuilding Yard, Greenwich, to the order of Messrs. McHall & Co., of Manchester, had her official trial with highly satisfactory results. The dimensions of the vessels are :—Length, 70 ft. ; breadth, 16 ft.; draught, loaded, 4 ft. 6 in., she is fitted with compound surface condensing engine of 80 H.P., and has been built for river and coasting service in Portuguese West Africa. Mr. T. H. Page, of Leadenhall Street, superintended the construction of the vessel on behalf of the owners. The vessel left the Thames on June 9th, and arrived at Lisbon on June 16th, encountering bad weather on the voyage.

Pansy.—On June 8th the s.s. *Pansy*, built by the Grangemouth Dockyard Co. for Messrs. Richard Hughes & Co., of Liverpool, left their yard for a trial of her engines, supplied by Messrs. Hutson & Son, Kelvinhaugh, Glasgow. The *Pansy* is a typical specimen of the modern coaster, the engines being fitted aft, with one clear hold forward, and large hatches supported by web frames and brackets in such a manner as to dispense with hold pillars. A deadweight of 750 tons will be carried on a small draught, and the register tonnage of the vessel has been reduced to a very low figure, a very important point with vessels coming frequently in and out of port. For the same reason the usual sloping stern has been replaced by vertical bulwarks with wood rubbing piece. The machinery worked with perfect smoothness and without a hitch, and the vessel at once proceeded to load for Denmark.

Vera.—On June 10th the despatch tug *Vera*, built by Messrs. T. B. Seath & Co., Rutherglen, and engined by Messrs. M'Kie & Baxter, Copland Works, Govan, went for her official trial at Wemys Bay. The tug is 60 ft. long by 12 ft. beam by 5 ft. mean draught, and is a full-powered boat, having C.S.C. engines 10⅝ in. and 23 in. by 12 in. stroke, supplied by steam from a horizontal return tubular boiler. The circulating pump is one of Baxter's patent "Challenge" pumps. The trial was most satisfactory in every way, and the mean speed of four consecutive runs upon the mile was a little over 11½ miles per hour. The vessel has been built for service in Rangoon, and the machinery is the fifth set supplied by Messrs. M'Kie & Baxter to the same owners.

Ella.—On Tuesday, June 14th, the s.s. *Ella*, built by the Sunderland Shipbuilding Co., Limited, to the order of Hagbart Waage, Esq., of Christiania, through Messrs. Pile & Co., of London, was taken to sea on her official trial trip. The dimensions of the vessel are :—Length, between perpendiculars, 240 ft. ; beam, 37 ft. ; depth, moulded, 20 ft. ; gross tonnage, 1,437 ; register, 901 ; classed 100 A1 Lloyd's, special survey, flush-deck type, having bridge-house amidships and topgallant forecastle. The captain's, officers' and engineers' accommodation is under the bridge, a large saloon being placed at the forward end. The vessel is provided with winches, by Mr. R. Welford, of Pallion ; steering gear by Messrs. Alley & MacLellan, and tri-compound engines by Messrs. MacColl & Pollock, of Sunderland, having cylinders 18½ in., 30 in. and 49 in. by 33 in. stroke ; 160 lbs. working pressure. The trial was most satisfactory, the mean of several runs upon the measured mile gave an average speed of 10¼ knots ; the machinery worked splendidly, and everything else passed off in a most successful manner. During construction the steamer has been inspected by Captain J. M. Donvig on behalf of the owners.

Laura.—On June 14th the steamship *Laura*, built by Irvine's Shipbuilding and Dry Docks Co., Limited, West Hartlepool, to the order of Messrs The Pyman Steamship Co., Limited, of the same town, proceeded to sea on her trial trip. Her dimensions are as follows:—320 ft. by 46 ft. by 23 ft. 0½ in., with poop, extra long-bridge and topgallant forecastle, cellular double-bottom for water ballast, all fore-and-aft and in after-peak. Special regard has been paid for dealing with rapid loading and discharging of cargoes, for which large hatchways have been fitted with the company's latest type of powerful winches and double-derricks to each hatch, together with all the latest improvements in the entire outfit of the vessel, including Lord Kelvin's compasses, &c. The boats are placed on a platform-deck overhead, and forming an awning for the protection of the crew in tropical climates. The engines, which have been built by Messrs. Thos. Richardson & Sons, Limited, Hartlepool, are of the triple-expansion type, with cylinders 24 in., 38 in., and 64 in. stroke 42 in., steam being supplied by two single-ended boilers working at a pressure of 160 lbs. per square inch. During the trial a mean speed of 11½ knots was obtained, and the owners expressed themselves highly satisfied with the smooth working of the engines and general equipment of the vessel.

Lovaine.—On June 14th the large new screw steamer *Lovaine*, built by Messrs. Wood, Skinner & Co., Limited, of Bill Quay-on-Tyne, to the order of Messrs. Henry Scholefield & Son, Newcastle, left the Tyne on a trial trip. This vessel is a very fine specimen of a modern cargo boat, and is of the following dimensions, viz.:—Length, 325 ft.; breadth, 48 ft. 6 in.; and draught, 20 ft. 6 in. On the trial the vessel was fully laden with a deadweight cargo of 5,100 tons. The machinery consists of a set of triple-expansion engines, built by the North-Eastern Marine Engineering Co., Limited, Wallsend, with cylinders 23½ in., 39 in., and 64 in., by 42 in. stroke, with two large boilers working at 180 lbs. pressure, and during the trial the engines worked splendidly and gave entire satisfaction to all concerned. The special appliance in the engine-room include the North-Eastern Marine Engineering Co.'s patent combined feed-heater and cleaner, also their patent evaporator. On the completion of the trial the vessel sailed direct for Buenos Ayres.

Edenmoor.—On June 15th the screw steamer *Edenmoor*, which has been built to the order of Messrs. Walter Runciman & Co., of Newcastle, by Messrs. John Readhead & Sons, of South Shields, to replace the vessel of the same name which Messrs. Runciman lost by fire in the Red Sea in November last, was taken on her trial trip, when on the measured mile a speed of about 12 knots was obtained. The vessel has a capacity of 5,500 tons deadweight and a draught of 21 ft. 6½ in.; she is 326 ft. in length, 47 ft. in breadth and 26 ft. 4½ in. in depth. The engines, which have also been built by Messrs. Readhead, have an indicated H.P. of 1,200, and are of the triple-expansion type, the cylinders being 24 in., 40 in., and 64 in., with a 42 in. stroke. She is fitted with two large steel boilers from the same firm, and is thoroughly equipped in every respect. The *Edenmoor* is specially intended for the shallow water trade, and will shortly leave the Tyne for the Gulf of Mexico, in ballast, and will be commanded by Captain Dyason.

Beacon Grange.—On June 15th a further addition to the large fleet owned by Messrs. Houlder Brothers & Co., Limited, of London, has been made by the addition of the *Beacon Grange*, the trial trip of which took place in Belfast Lough, having on board a numerous company representing the owners, builders and their friends. A large party from London crossed *via* Liverpool, in the *Logic*, by special arrangement with Mr. McDowell, of the Belfast Steamship Co. This is the fifth vessel built by Messrs. Workman, Clark & Co., Limited, Belfast, for the Houlder Line, and another is at present in an advanced stage. To suit the many requirements of the trade in which the vessel will be engaged in between London, Liverpool, Glasgow, Newport, Cardiff, South America, Australia, East and West Africa, special designs and constructions have been introduced and extra attention given to the many details of arrangement in a vessel which will be engaged in so many different portions of the globe. She has been built and classed to Lloyd's highest requirements under special survey, and to the Board of Trade regulations for carrying first and second-class passengers. The principal dimensions are:—Length, 370 ft.; breadth, 47 ft. 6 in.; depth, 30 ft.; with a gross tonnage of 4,040, and capable of carrying a deadweight cargo of 6,300 tons on a moderate draught. A cellular double-bottom extends fore-and-aft, giving additional safety to the vessel and affording with the fore and after-peaks, space for about 950 tons of water ballast. Eight bulkheads subdivide the vessel into compartments, five of which are utilised for cargo purposes, for the loading and discharging of which the most complete arrangements have been made. Eleven powerful steam winches, by Messrs. Clarke, Chapman & Co., of a design and construction specially prepared for this steamer, are supplied, and the derricks and gear are adapted generally for lifting 7 tons, while provision is made for taking in weights up to 10 tons at two of the hatches. In addition, a large derrick for extra heavy lifts is also fitted up, so that practically any cargo can be loaded, as the hatches have been prepared so as to allow large pieces to be handled, and the obstructions usual in the holds of vessels of this size have been reduced to a minimum, as a system of framing to obviate this having been introduced throughout Messrs. Houlder's steamers. This is of the greatest benefit also for giving a large insulated capacity, and as most of the holds have been insulated a maximum of space is obtained for both ordinary cargo purposes and the frozen meat trade in which she will be engaged in on her homeward voyages, and a capacity of 1,100 tons has been obtained for this latter purpose. The work of insulating is of itself a work of large extent, and has been very successfully carried out by Messrs. Gregson & Co., of London, on the most approved principle. As in the previous vessels, the refrigerators are on the carbonic acid gas system, and with the machinery, have been supplied and fitted up by the well-known firm of Messrs. J. & E. Hall, Limited, of Dartford, Kent. A chamber for stowing butter, fruit and fish is provided, as well as one for carrying the more perishable provisions required for the passengers on the voyage. On the upper deck of the vessel are erections covering, practically, all the deck with the exception of a space for the foremost and aftermost hatch. The bridge-deck is about 180 ft. long, and on this deck is placed the passenger accommodation, in a large house extending for the greatest part of its length. The first-class state-rooms, saloon, &c., are in the fore-end, and are most comfortably fitted with all modern conveniences, such as electric bells, steam heating, electric lights, hot and cold baths, &c. Handsome framing in oak, with painted panels of a chaste and elegant floral design, are introduced in the saloon, while the upholstery is made to harmonise with the design of the room. The ceiling is handsomely panelled and the fittings throughout electro-plated, and a piano of Collard & Collard's make is placed in a suitable position. A large smoke-room, with comfortable sofas extending along two sides, and supplied with tables, is set apart for the passengers. The second-class passengers are also well catered for, their apartments being suitably fitted up, and with a saloon for their independent use, and having similar conveniences to the other passengers, including hot and cold baths, &c. In a separate portion of the deck-house the officers of the vessel have their living rooms and saloon, which are large and comfortable. The roof of this deck-house forms a spacious promenade for the passengers in fine weather, and serves to house the lifeboats which are placed on each side. There are many auxiliaries required in such a vessel, and these are well provided for, principally under the forecastle, the forward-end berthing the crew, while the cattlemen and others take another portion in independent rooms, steam heating being provided here also. A large number of cattle can be carried under the bridge, in all about 280 head, and permanent slingable pillars are fitted, as well as the most approved fittings that can be adopted for this purpose. An efficient water service, with means for conveniently watering the cattle, is supplied, and the shifting of these is expeditiously arranged for by several gangway doors through each side of the bridge; a large condenser of Kirkaldy's make, ensures an abundant supply of water throughout the voyage. A very complete installation of electric lighting has been carried out by Messrs. The Globe Electrical Co., London, and is carried throughout the vessel to all the rooms, machinery spaces, and includes arc lamps, so that work can be carried on continuously at the loading or discharging of the cargo. The navigating of the vessel has been carefully looked after and is, in all departments, fully requisite for handling easily a vessel of this size. Messrs. Amos & Smith supplied one of their patent steam-steering gears, controlled from the flying bridge. Arrangements for warping by steam power, provided both forward and aft, and a capstan is also provided, independent of the windlass, which is one of Messrs. Emerson, Walker's well-known make. Many other specialities might be mentioned, including docking and steering telegraphs, and all combining to make this department most complete, and ensuring the utmost degree of safety and skill in the navigation. The *Beacon Grange* is schooner-rigged, and has two telescopic steel masts to suit the bridges on the Manchester Canal. The fitting out of a vessel of so many capabilities, and of keeping in advance of the times, ensure a large amount of care, and on Messrs. Houlder's behalf this has been successfully carried out under the supervision of Mr. Copeland K. Etheridge, their marine superintendent. The machinery, capable of developing about 2,800 I.H.P., was also constructed at the builders' engine works, to the most modern design and principle of triple-expansion engines. The cylinders are 26 in., 43 in., 72 in., stroke 48 in. Steam is supplied from two large steel boilers at a pressure of 190 lbs., and fitted with Messrs. James Howden & Co.'s forced draught. A donkey boiler for supplying steam to the auxiliary machinery at 90 lbs. is fitted in the stokehold. Powerful steam pumps, by the best makers, for feed and ballast purposes, are situated on one side of the engine-room, and leaves a good clear space about the engine for free movement. The machinery department has been under the superintendence of Messrs. Wm. Esplen, Son, & Swainston, of London. On the trial mile, which was run early in the day, previous to taking a cruise about the Belfast Lough, a speed in excess of the guarantee conditions was obtained. The sister vessel, the *Royston Grange*, having lately made the record run from London to Buenos Ayres in 21 days, averaging 12 knots. The company during the day, were entertained by the builders, and returned to Belfast by the tender as the *Beacon Grange* proceeded direct to Greenock to coal, previous to loading for her maiden voyage under the command of Captain Robert Taylor.

Cardiff.—On June 15th the fine steel screw steamer *Cardiff*, built by Messrs. Wm. Gray & Co., Limited, and owned by Messrs. W. G. Morel & Co., of Cardiff, was taken to sea for her official trip. She is of the following dimensions:—Length, 329 ft.; breadth, 46 ft.; and depth, 23 ft. 6 in. Her machinery is of the triple-expansion type, manufactured by the Central Marine Engine Works of the builders, the cylinders being 23 in., 36½ in., and 62 in. in diameter, with a piston stroke of 39 in., and steam is supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. After the usual manœuvring of the vessel for adjustment of the compasses, several runs were made along the coast, the mean result of her performance being a speed of 11¼ knots. Mr. W. G. Morel, one of the owners, was present (this gentleman has also superintended the construction of the vessel and her machinery). Captain Murrell represented the shipbuilders, and Mr. James Lindsay, the engine builders. On the conclusion of the trial the vessel at once proceeded to Hull, where she takes in a cargo of coal for Buenos Ayres.

Regele Carrol I.—On June 16th the new twin-screw steamer *Regele Carrol I.*, which the Fairfield Shipbuilding and Engineering Co., Limited, have built for the Roumanian States Railways, ran her official trials in the Firth of Clyde. The trials consisted of six hours' steaming at full speed, with six runs over the measured mile at Skelmorlie. In the six runs a mean speed of 19 knots per hour was attained. This was considerably over the speed guaranteed by the builders. The new steamer is intended to open a new line from the Continent, which will connect directly from London and Paris to Constantinople, and thence to Alexandria.

Roseneath—On June 22nd the steam yacht *Roseneath*, built for the Earl of Cavan, K.P., by Messrs. J. G. Fay & Co., Southampton, of the following dimensions:—125 ft. by 17 ft. 6 in. by 11 ft. 6 in. went her official trials with very successful results. The contract speed was 12 knots for four hours continuous running, and the speed obtained was fully a mean of 13 knots. The engines are of the triple-expansion type, cylinders 10½ in., 17¾ in., and 29 in. by 21 in. stroke, worked without a hitch, the boiler held steam right through without difficulty, and the vessel proved herself very handy, stiff and a good sea-boat.

Plencia.—On Thursday, June 16th the fine steel screw steamer *Plencia*, built by Sir Raylton Dixon & Co., Limited., Cleveland Dockyard, Middlesbrough, was taken out to sea for her official trials, under the command of Captain Alfredo Arcocha. She is built to Lloyd's highest class, her principal dimensions being:—Length, 299 ft.; beam, 42 ft.; depth, moulded, 20 ft. 3 in.; and has a deadweight carrying capacity of about 3,500 tons on a light draught of water. Triple-expansion engines have been fitted by Messrs. Blair & Co., Limited, of Stockton-on-Tees, having cylinders 22½ in., 36½ in., 60 in. by 39 in. stroke, with two large single-ended boilers working at 160 lbs. pressure. Captain Ybarra representing the owners, and a large number of friends were on board during the trial trip, which was highly successful, the vessel afterwards proceeding to the Tyne to load.

Succia.—Lately Messrs. Blackwood & Gordon, Port-Glasgow, have had a very successful trial run with the s.s. *Suecia*, built and engined by them for the Svenska Lloyd, Gothenburg. The steamer, dimensions of which are 205 ft. by 31 ft. 6 in. by 16 ft. 4 in., is intended to trade between Gothenburg and Hamburg. On trial with full cargo of 1,050 tons on board she obtained a speed of 10½ knots over a lengthened period with a low coal consumption. Captain Kinnman and Mr. Johnson, of Gothenburg, who represented the owners, expressed themselves highly satisfied with the results.

Kasuga Maru.—Lately the new steamship *Kasuga Maru*, built by Messrs. R. Napier & Sons, Limited, for the Nippon Yusen Kaisha (Japan Mail Steamship Co.), completed a series of speed and consumption trials on the Firth of Clyde, and fully implemented all the conditions of the contract. The *Kasuga Maru* is the first of three steel screw steamers the builders have on hand for the company, and has been specially designed to meet the requirements of their Japan and Australian service, being built under special survey to Lloyd's highest class, and fitted in accordance with the Japanese Government rules and the British Board of Trade regulations. The general dimensions are:—Length, 375 ft.; breadth, 44 ft.; depth, 27 ft. 8 in.; with a topgallant forecastle, long bridge, full poop, and partial shade deck, and constructed with a cellular double bottom for water ballast. The upper decks and fittings are of teak, and the most modern appliances have been supplied for the efficient working of the ship and cargo, including refrigerating machinery and chambers, mechanical ventilation, steam heating, and a complete installation of electric lighting, with duplicate dynamos. The machinery consists of a set of triple-expansion engines, having cylinders 29 in., 48 in., and 79 in. diameter by 54 in. stroke, with two double and one single-ended boilers for a working-pressure of 185 lbs., and fitted with the most modern appliances for efficiency and economy. The Nippon Yusen Kaisha were represented by Captain A. K. Brown, Japanese Consul, and the results of the trials were very satisfactory.

Sylviana.—This vessel, built by Messrs. Craig, Taylor & Co., of the Thornaby Shipbuilding Yard, has just left the Tees for New York, after very satisfactory trial trip. The dimensions of the vessel are 372 ft. by 48 ft. by 30 ft. 11 in., depth, moulded. She is of the spar deck type, with poop, bridge and topgallant forecastle; built of steel to Lloyd's highest class. She will carry over 7,000 tons deadweight, and is equipped with 6 large double-power steam winches, patent direct steam windlass, powerful steam steering gear, a full set of shifting boards for grain certificate, and all the latest improvements. She has water ballast in double-cellular bottom fore-and-aft, also in peaks; she is rigged as a fore-and-aft schooner with telescopic masts to Manchester Ship Canal requirements. Her engines are by Messrs. W. Allan & Co., Limited, of the Scotia Engine Works, Sunderland. the cylinders being 23½ in., 38½ in., 68 in. and 48 in. stroke, with three boilers working at 200 lbs. pressure. and on the trial a speed of 11½ knots was obtained. The steamer has been built for Messrs. Furness, Withy & Co., Limited, West Hartlepool. It may be mentioned that the *Sylviana* is one of the largest vessels that has, as yet, left Stockton, and she is under the command of Captain Wyatt.

Workmen's Compensation Act, 1897.—In view of the Workmen's Compensation Act, 1897, coming into force on the 1st July, it will doubtless interest our readers to have some information as to safety appliances and fittings for the prevention of accidents in factories, &c. We have received particulars of various appliances which are being put on the market by Messrs. Wallach Brothers, of 57, Gracechurch Street, London, E.C. Among these may be mentioned a V shaped gauge-glass protector, with wire-embedded glass plates and pivotted clamp attachment, adapted to be fitted to ordinary gauge-glass fittings. Another pattern of horse-shoe shape, is also made of this device. A useful adjunct for similar fittings is a luminous gauge-glass reflector, which affords a very reliable effect to be produced for showing the water-level. For the protection of workpeople against poisonous gases, vapours, dust, etc., a nose, throat and lung protector and respirator is illustrated and described in the circular, it is very light, and while affording efficient protection, it does not cause any inconvenience to the wearer. Various forms of eye protectors are also described, and gloves arranged as heat and fire-proof protectors, and insulating gloves for electrical purposes are included as well. To avoid risk from accident from belting, an ingenious belt-lifting device is listed, which is simple in construction and efficient in use, and can be operated in putting a belt on without slowing down the machinery. We have described and illustrated many of these articles in past issues,

Stern-wheel Steamers for the River Magdalena.—The West India & Pacific Co.'s steamer *Yucatan*, left Liverpool on June 4th, carrying among her cargo the steamer *Martinez Bossio*, being the first of two stern-wheel steamers just constructed by Messrs. Yarrow & Co., Poplar, London, E., for the River Magdalena, Colombia, South America. This river is being opened up more and more every year, and, although the depth of water in parts is so little that the river for a long time was looked upon as not being navigable, the type of boat, of which Messrs. Yarrow have built a large number, has so far mastered the difficulty that a large and lucrative trade is now being carried on by their means. The dimensions of the two boats lately constructed are:—Length, 150 ft.; beam 31 ft.; and depth, moulded, 4 ft. 9 in. They will be driven by compound surface-condensing engines, and fitted with a boiler of the locomotive type, weighing 13½ tons. About 270 tons of cargo can be carried on a draught of 2 ft. 9 in., this draught being sufficiently light for the purposes of navigation in nearly all the higher reaches of the river.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

CONNECTING RODS.

To the Editor of The Marine Engineer.

Sir,—Please do inform me in your valued next, why an engine with a long connecting-rod works more smoothly for a long time than an engine with a short one.

I remain, dear sir,
Respectfully yours,
B. Paling.

Amsterdam, 22nd June, 1898.
Nieuwendijh 56.

[The longer the connecting-rod as compared with the length of the crank, the better is the direct moment for turning, without large resolutions of effort indirectly upon the cross-head guides and the crank bearings. It is these latter indirect strains, due to short connecting-rods, that cause wear and tear upon crank bearirgs and cross-head guides, and in time render the bearings slack and cause knocking.—Ed. M. E.]

Reviews.

The Scientific American. Special War Number. New York, April, 1898.

A very interesting and opportune publication is this special issue of the *Scientific American* which gives an interesting historical account of the rise and development of the New American Navy which is now so actively engaged in showing its capabilities in both hemispheres. For nearly the space of a generation after the close of the Civil War, the Americans—who had taught Europe the value of armour, and the idea of the turret and of underwater protection—were content to let things naval entirely alone, and to allow their existing ships to become obsolete. Suddenly, in the year 1883, the policy of the United States was, in this regard, changed and three cruisers and a despatch boat of the most modern type were ordered to be built. These vessels formed the nucleus of the fine assemblage of ships described and illustrated in the present volume. Much interesting detail as to guns, armour, and other appliances of modern naval warfare is also included in the volume which is popular as well as scientific. The dry docks of the country are incidentally portrayed, and descriptions are afforded of the dynamite guns of the *Vesuvius*, which are believed to have wrought considerable havoc at Cuba—and of the submarine *Holland* boat. The latter is held to be the most practical of all the many attempts, made in so many countries, to grapple with the problem of sub-marine navigation. The volume closes with tables of the ships and ordnance of the fleet, and should certainly be in the hands of every one who wishes to appreciate the conditions of modern naval warfare, and especially of those who desire to have an intelligent appreciation of what is passing in the Caribbean Sea.

The Resistance and Propulsion of Ships. By William F. Durand. London: Chapman & Hall, 1898.

This is the English edition of the work of the Principal of the School of Marine Construction in the American Cornell University. It deals with a subject upon which, as all our readers are aware, much time and brains have been expended of recent years on both sides of the Atlantic. Mr. Durand necessarily makes large use of the works of his predecessors, and he fully acknowledges the assistance he has received. The question of drag in shallow water—so largely noticeable in trials of large and fast steamships—is very thoroughly dealt with, and some interesting results recorded at the trials of the *Jeanne* are tabulated. A large amount of space and work has naturally been devoted to the scientific treatment of that thorny subject, the designing of propellers. A long chapter is that, too, which treats of the question of powering ships. An interesting chapter is that on trial trips. Here we are afforded some hints as to the means whereby the best apparent results can be shewn. But in this matter, the experienced shipbuilder can be taught little by the greatest scientist. In this connection there is an interesting diagram at page 395, where we see graphically shewn the speed and distance and speed and time current for various speeds. Here the writer agrees with the results of the British Association experiments, and lays it down that the distance in which a ship can be stopped is practically independent of the power at work to move her, or in other words, of the speed at which the experiment may be made. Two somewhat exhaustive tables of recent fast steamers are added. In the first of these he shews the displacement, dimensions, draught, area of midship section, and three co-efficients (viz.: block midship section and prismatic) of numerous important vessels. In the second, he gives information as to the propellers of the vessels (and others) mentioned in table A. He also gives their trial results—not data as he calls them—shewing I.H.P. number of revolutions, speed and apparent slip per cent. The book is a very painstaking contribution on a very intricate and difficult subject and very well summarizes the position of knowledge in this branch of science at the present day.

The Calorific Power of Fuels. By Herman Poole, F.C.S. London: Chapman, Hall & Co. 1898.

This volume claims to be an exhaustive statement of the present sum of knowledge on the important subject with which it deals. The author (who writes privately for American readers, the book being published also by Messrs. John Wiley & Sons, of New York) has founded his work on the *Pouvoir Calorifique des Combustibles*, of M. Scheurer-Kestner. But a great deal has had to be done in the way of alteration and re-statement to adapt the French information—stated in metrical standards—for the new class of readers for whom Mr. Poole writes. He has also availed himself, as he is the first to acknowledge, of almost everything worth consulting in relation to this subject. Full illustrated accounts of all the calorimeters known to scientific men are first appended together, with an explanation of the methods of using them, and of the accuracy attainable by their use, it being obvious that a knowledge of calorific power can only be attained by the possession and use of such instruments. Then an examination is made of the comparative values of solid fuels, including coal, coke, lignite, peat, wood, and charcoal. Great stress is laid on the importance, when using solid fuel, of having it thoroughly dried. This is true of coal and peat, but it is especially so in the case of wood. Then follow chapters on liquid and gaseous fuels. Important hints are given as to the management of fuels to get the full advantage out of them for steam raising purposes, and information as to the due supply of air, and as to the examination of the quantity and quality of the waste gaseous products is also afforded. The appendix contains some very valuable tables, as to the characteristics of various fuels derived from different countries. The book should be of great service to engineers, and steam-users, and should enable them to effect many economies in the working of the plant.

Transactions of the Hull and District Institute of Engineers and Naval Architects. Vol. XI. Goddard & Son, Hull. 1898.

This volume covers the period 1895-6. It contains a couple of papers, at least, which may be said to be of considerably more than local interest. One of those to which we might especially refer, is that by Mr. F. Somerscales on the design and arrangement of ships' cabins and their fittings. This paper—like some others in the volume—is copiously illustrated with diagrams and plans. We might, perhaps, take exception to the statement on page 111, that Sir Walter Raleigh's condemnation of "cabbins" no longer applies. One of the great navigator's charges against them was that, "in fight, they are dangerous to tear more with their splinters." This is surely as true now as then, and warship designers seem puzzled with the problem as to how to dispense with wooden fittings altogether.

Mr. F. H. Pearson's paper on "Inquiries, Tenders, Specifications, and Contracts," is one which conveys much interesting information on the Mercantile practice of shipbuilders. The volume looks well in its new cloth dress.

Lean's Royal Navy List. April, 1898.

The current issue of this quarterly publication is as thoroughly deserving of commendation as its predecessors. The war and meritorious services of the various officers are becoming more and more fully set out in each succeeding issue, whilst, as far as we can test it, the accuracy of the information is very strict.

There is one point in which we think a slight improvement might be effected, and that at very little expenditure or trouble. It is in regard to the Fleet List. Here we have full information as to the character, size, and power of the various vessels in the Royal Navy. As regards vessels in commission, we are further told their station and the date of their commission. But it is as regards vessels not in commission that our suggestion applies. We are merely told the name of the port to which such ships are attached. It would be a very valuable piece of information if we could be told in which of the five divisions of the Fleet Reserve the vessel was at the time of going to press. The addition of a single letter to the matter already afforded would give us all the information we require. If recent events have taught us anything, it is the need for constant readiness. The knowledge as to what vessels are in the A Reserve, ready for instant mobilisation, and which are in the E Division awaiting the ship-breaker, is very interesting and important to Service men and civilians alike, and at present it seems inaccessible to the public. The indefatigable editor of Lean's Royal Navy List will surely confer a public benefit if he can see his way to the adoption of this suggestion.

Steam Boiler Construction. By W. Hutton. London; Crosby Lockwood & Co. 1898.

We welcome the third edition of this very useful work with great pleasure but without any surprise. The public was sure—as we were careful to tell our readers when we reviewed the earlier editions—to appreciate the work which Mr. Hutton had done for it. The book is attractive. It is scientific, yet not dry, and in every way it is practical and up-to-date. The present edition shows how thoroughly the author caters for those who lean on him for guidance.

He deals with the economy possible to steam users—a wise economy being the only study which can profit those who mean to live in these highly competitive times.

Rubbish destructors, especially those which are steam raisers also, are a feature of the day, so Mr. Hutton has now something to say about them. In the same way he adds particulars of a great number of steam boilers of the water-tube type which have come into prominence since the last edition of the book was before the public.

Altogether some 175 pages and upwards of that number of illustrations appear for the first time in the present issue.

The question of superheating too, is coming to the front, and this subject has not been neglected in the present issue. On the whole we may safely recommend our readers to this volume for up-to-date and practical information.

Reed's Useful Hints to Sea-going Engineers. Sunderland: Thos. Reed.

This is the third edition of this exceedingly useful volume. Opportunity has been taken of the occasion to increase the scope of the work so as to cover the recent additions to a properly-equipped engine-room. Amongst the appliances which are now treated are evaporators, feed-water heaters, filters, and auxiliary pumping machinery. A very large number of instances of actual mishaps to machinery, boilers and shafting are detailed, and the mode in which ready-witted engineers overcome apparently insuperable difficulties are clearly detailed for the enlightenment of, and suggestion to, their professional brethren. The damage and its treatment are in nearly all cases rendered more easy of appreciation by a full selection of cuts and diagrams. But these matters do not comprise the whole of the valuable assistance which the authors have collected. There are a number of very useful hints on the arrangement of their kit, as to the management of their health, as to the maintenance of discipline, and to the apportionment of their work which cannot fail to be very instructive, especially to the younger members of the engine-room staff. There is only one remark which calls for adverse criticism, and that probably inserted by accident. A particular and much-advertised brand of soap is named the engineers' favourite. Somehow, though it is pleasant to see books recommended, the approval of an article of the kind we name seems repugnant to one's sense of the proprieties. This, however, is a matter that does not affect the professional value of the book, which is certainly very great. The book is obviously written by practical engineers of experience who place what they have acquired completely at the disposal of their readers.

The Indicator Handbook. By Charles N. Pickworth. Manchester: Emmott & Co. 1898.

The author of this little volume is already known to the public from his previous literary work, especially from his excellent work on the slide-rule. His present aim has been to produce a book which shall, in a handy form, initiate students and young engineers into the mysteries of the indicator and afford them a guide to its practical treatment. As most of our readers know, it is not every one of those who can answer an examination paper on the subject that could get out a set of diagrams correctly, or could understand the allowances and adjustments which the appliance requires in practice. But Mr. Pickworth very clearly and lucidly explains the design and construction of the various types of indicators with their peculiarities and treatment, and generally puts the student in the way of achieving good practical work. We may add that the little volume is full of good illustrations and has an excellent index. It admirably fulfils the author's intentions and should prove useful to a numerous class.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from May 13th to June 9th, 1898.

10905	A. E. Seaton and J. E. L. Ogden. Reducing valves.
10919	T. L. Livingston. Ships' capstan arrangements.
10920	T. L. Livingston. Ships' steering arrangements.
10921	T. L. Livingston. Ships' screw steering gears.
10938	J. Broadfoot. Ships' side scuttles.
10994	F. F. W. Walther. Bollards for ships.
10995	C. F. W. Krüll. Reversing engines.
11025	J. C. Dobbie. Steam engine indicators.
11026	J. C. Dobbie. Steam engine indicators.
11027	R. Richardson. Steering gears.
11023	A. Murray. Hydraulic capstan.
11032	R. Anderson. Buoys.
11047	W. H. Bushell and L. R. S. Tomalin. Steam boiler.
11055	R. Schulz. Steam turbines.
11060	P. Brotherhood. High-speed steam engines.
11093	R. Türr. Ships.
11098	W. H. Place and D. Jolly. Valves.
11120	H. Gibson. Water-gauges for steam boilers.
11141	G. F. Archer. Steam generators.
11211	J. Henderson. Fuel stoker for boilers.
11214	W. Cutler. Hammock
11220	P. E. Singer. Engines.

11236 J. C. Chapman (F. G. Saylor, United Stes). Steam generators.
11240 G. J. Milton. Lock-nuts.
11243 D. T. Andrews and H. F. Wilkinson. Boiler cleaners.
11258 L. J. J. B. le Rond. Rotary engines and pumps
11267 F. Thiele and A. Röttger. Firing steam boilers.
11274 H. and W. Hildebrand and A. Bruckmann. Engine.
11275 H. and W. Hildebrand and A. Bruckmann. Boiler.
11276 H. and W. Hildebrand and A. Bruckmann. Valve.
11306 C. A. Houften and J. Pickbourne. Lock nuts.
11323 J. Dean and J. Pollard. Steam boilers.
11336 A. Mitchell. Water-tube boilers.
11366 A. Marx and W. Dodschweit. Treadle-motor boat.
11392 J. H. and F. Riley. Rotary pumps.
11410 M. Morris. Water turbine.
11461 W. Huggins. Steam engines.
11492 R. F. Moore. Speed indicator.
11512 J. Brown & Co., Limited, and J. Nodder. Furnaces.
11541 J. Worsnop. Metallic packing
11627 W. S. Smith. Cables.
11654 T. Burrows. Utilising the motion of the sea.
11662 F. Fawcus. Life-belts.
11668 F. O. Petterssen and C. Franc. Propellers.
11671 H. Lentz. Governor for steam engines.
11689 W. M. Theobald. Finishing steel plates.
11694 J. A. Shearer. Vessels.
11708 G. E. Morgan. Steering ships.
11761 J. A. Reardon. Steam engine.
11766 B. B. Strong. Valve-controlling devices.
11776 J. Esplen. Frames for winches.
11782 J. H. Tangye and W. Johnson, jun. Motive-power engine.
11806 J. T. Morris and R. K. Spencer. Screw propellers.
11822 G. F. Redfern (A. Christophe, France). Steam boilers.
11889 J. Abell. Variable cut-off for engines.
11904 P. Jensen (P. Malvezin, France). Furnace bars.
11929 A J. Bull. Beam compasses.
11968 W. F. and W. J. Kershaw. Propelling boats.
11978 H. T. Howard and A. Robb. Warp-guides for fishing vessels.
12002 J. Watson. Compound engines.
12056 W. D. Wight and M. B. Wild. Valves.
12071 W. Robinson and J. Leyman. Winches.
12108 A. Backhaus. Piston rings.
12128 W. Kimberley. Wrenches.
12146 A. Lyon. Valve for steam engines.
12168 T. Cooper. Thrust block for propellers.
12209 J. Weir. Feed-water apparatus for boilers.
12217 H. W. Longmate. Valves for steam engines.
12254 J. Gööz. Smokeless firing for boiler furnaces.
12275 A. Krefting. Manufacturing products from seaweed.
12277 A. Krefting. Manufacturing products from seaweed.
12289 L. Gunn. Cooling temperature in vessels.
12308 J. Weir. Removing deposits on boiler-tubes.
12330 E. Brook. Steam generator furnaces.
12361 N. Vincke. Internal combustion engines.
12396 W. Weir and J. R. Richmond. Removing oil from water.
12426 S. Frank. Valves.
12439 M. M. J. O. O'Conor. Apparatus for dredging.
12472 H. S. Hele-Shaw. Navigable vessels.
12497 H. A. Boes. Means of propelling steamships.
12507 L. Schneider. Valve for steam boilers.
12538 H. L. Butler. Wrenches.
12540 C. W. Foster. Propellers.
12548 J. Weir. Water-tube steam boilers.
12563 N. Mc E. S. Douglas. Ships' leak stoppers.
12600 A. J. Cook. Separating oil from feed-water.
12631 A. R. Turner. Indicator for ships' side lights.
12632 J. Callard. Automatic life-saver for engines.
12652 J. B. Allfree. Valve gear for steam engines.
12665 F. G. Hampson. Bending of ships' plates.
12686 A. Grafton. Cranes.
12687 F. W. Griggs and A. E. Infield. Propelling boats.
12706 J. Hutchison. Controlling steam engines.
12741 E. G. Barnes. Utilising the power of waves.
12756 L. Turgin. Boilers.
12778 R. Ward. Blocking leaking boiler tubes.
12790 P. G. Baldwin. Self-stoking apparatus for furnaces.
12798 J. H. Sutcliffe. Funnels.
12806 F. O. Johnson. Nut locks.
1 820 J. Leopold. Appliance for stoking furnaces.
12821 W. Elliot and Elliot & Garrood, Limited. Capstans.
12842 C. D. Abel (J. King, C. Downes, and M. A. Iwan, Argentine Republic). Heating feed-water.
12843 E. C. F. James. Sectional folding boats.
12849 J. Björnstad and Easton, Anderson & Goolden, Limited. Valves.
12855 G. Hill. Denoting position of ships' doors.
12946 W. Baines, jun. Armour plating.
12972 L. Doerk. Process for drawing steel tubes.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

May 28th, 1898.

Blackaller, E.A.	2C	Liverpool
Bond, John	2C	Aberdeen
Bridge, F. W...	2C	L'nd'ndry
Butcher, E. G.	2C	London
Chalmers, J. ..	2C	N.Shields
Child, Wm. W.	2C	S'nd'rl'nd
Dearden, H. G.	2C	"
Dettmer, H. W.	1C	"
Dutton, A.E...	2C	Aberdeen
Fyfe, Chas L.	2C	London
Gillespie. W. T.	2C	N.Shields
Hicks, Wm. J.	1C	Aberdeen
Humble, Robert	1C	N.Shields
Jolliffe, C. H. ..	1C	"
Kerr, A. W.....	2C	Liverpool
Lee, Herbert ..	2C	N.Shields
Legender, T. ..	1C	S'nd'rl'nd
Mackinlay, D. J.	2C	Liverpool
Mannell, J. A.	2C	London
M'Gregor, Robt.	1C	Liverpool
Millie, George..	2C	London
Moffat, Robert	2C	Hull
Nichol, Joseph	2C	N.Shields
Pinkney, E. W.	2C	"
Robertson, F. C.	2C	"
Robertson, G M.	2C	S'nd'rlnd
Spink, P. G. ..	2C	Hull
Tomkins, Jno...	1C	London
Tosh, William	2C	Aberdeen
Young, Robert..	1C	N.Shields

June 4th, 1898.

Ashton, Fredk.	2C	Liverpool
Bennie, Wm. ..	2C	"
Boyack, Peter..	1C	Glasgow
Burnett, H. W.	1C	N.Shields
Callander, G. R.	1C	London
Cross, Alex. K.	1C	Glasgow
Dixon, Frank ..	1C	N.Shields
Gilmour, E. R.	2C	Glasgow
Hallwood, Chas.	2C	Liverpool
Holmes, Wm. ..	2C	"
Hosgood, S. B.	1C	Cardiff
Ingram, H. J...	1C	N.Shields
Jardine, J. H...	2C	Liverpool
Jarvie, Hugh M.	1C	Glasgow
Jenkinson, Wm.	1C	Liverpool
Leopard, T. T.	1C	London
Le Quesne, A.P.	2C	S'h'mptn
MacGregor, Jno.	2C	N Shields
Mackay, Robert	1C	Glasgow
Milne, Geo. A...	2C	N.Shields
Morgan, H. W.	1C	"
M'Pherson, M'G.	2C	Cardiff
Nicol, Wm.	1C	Glasgow
Ogle, Geo. C. ..	2C	N.Shields
Paterson, Wm.	2C	Glasgow
Potts, Thos. ..	1C	N.Shields
Pugh, Lewis J.	2C	Cardiff
Robertson, A...	1C	London
Smith, James L.	1C	S'h'mptn
Smith, Robert..	1C	Liverpool
Stevens, A.	2C	Glasgow
Stevens, James	1C	"
Swinburne, W.	2C	N.Shields
Tucker, Alfd. E.	1C	London
Urquhart. A. A.	1C	Glasgow
Waddle, Thos. F.	1C	N.Shields
Wallace, Frank	2C	Glasgow
Woodall. A. H.	1C	Cardiff
Young, R. T. ..	2C	Glasgow

June 11th, 1898.

Carrick, Jno. A.	2C	London
Crighton, David	2C	"
Davies, Jno. ..	1C	Liverpool
Dixon, James..	2C	"
Fletcher, H. L.	2C	"
Mackenzie, A...	2C	London
Milln, Chas. ..	2C	Liverpool
Mitchell, R. H.	2C	London
Molley, Ed. P.	1C	Liverpool
Stout, Wm.....	1C	"
Williams, Jno.	1C	"

June 18th, 1898.

Baile, Richd. O.	1C	Liverpool
Baillie, Duncan	1C	Greenock
Brebner, Wm...	2C	Liverpool
Brooks, A. H. ..	2C	Greenock
Douglas, Robt.	2C	Leith
Dunlop, J. B. ..	2C	London
Gibson, David..	1C	Liverpool
Grandhi Sorabjee Khurshedjee	2C	Leith
Henry, D. A. ..	2C	N.Shields
Hutchinson, C.	2C	"
Hutchison, Wm.	2C	Hull
Innes, Wm. M.	1C	Greenock
Jack, Wm.	1C	Leith
Kirkpatrick, H.	1C	Liverpool
Macfarlane, D.	2C	Greenock
M'Ainsh, A. ..	2C	"
Maxwell, Jno. ..	1C	Dublin
Mc Innes, Wm.	2C	Hull
McNeil, Harold	1C	Liverpool
M'Gavin, James	1C	Greenock
Milner, A. R. D.	1C	Hull
Morrison, W. R.	2C	Greenock
Mumby, Edwin	1C	Hull
Norman, Jno...	1C	Liverpool
Osborne, A. G...	2C	London
Quilliam, A. P.	2C	Liverpool
Reddock, J. H.	1C	Greenock
Rioch, R. J. ..	1C	N.Shields
Roberts, Jno. F.	1C	Liverpool
Saville, C. R. ..	2C	London
Trimming, E.E.	1C	"
Whitfield, Wm.	1C	N.Shields
Whyte, Andrew	2C	London
Williams, J. B.	2C	Dublin

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The Marine Engineer.

LONDON, AUGUST 1, 1898.

THE general and widespread interest that has been taken in Dr. Nansen's Arctic expedition will probably give rise to further undertakings of a similar nature. It is somewhat extraordinary, with the great development of modern marine engineering, that the problem has not been attacked with a vessel provided with all the modern appliances of engineering skill to actually force her way through, at any rate, a large proportion of the impediments to be met with on such a voyage. It is ridiculous to suppose that a steamer cannot be constructed to bid defiance to any possibility of being ice-bound by ice of even 40 or 50 feet in thickness. It is now general knowledge that the sea-reaches are wide and open as regards land or impassable iceberg walls between Spitzbergen and Greenland, and the obstructions there to be met are only ice-fields, such as would be found upon the open sea. But a field of 10 or 20 feet in thickness has always hitherto been considered an impassable barrier unless, by chance, there are open channels or the field is broken up and in movement. We have no doubt whatever that if tenders were requested for an ice-boat, provided funds were forthcoming, which should be capable of absolutely penetrating such a solid ice-bound sea up to 40 or 50 feet thick, our naval architects and engineers would readily undertake to provide such a vessel. It is ridiculous that constant abortive efforts should be made by individuals, however distinguished by bravery and scientific attainments to reach that mysterious point, the North Pole, if the thing is worth doing at all, with such very inadequate means for penetrating to the desired spot. If it is to be done with certainty engineers must be asked to do it. A steamer specially constructed for the purpose should have ice-cutting screws, knives or revolving cutters, on which a large proportion of the steam power could be applied, with heavy propelling stern screws and a lifting ram for upheaving the detached masses. The hull, to prevent nipping, as has already been done, should be so splayed as to lift under a nip, and, of course, be of cellular construction, and especially stiffened with a turtle-back deck, transverse bulk-head, and beams of great strength. We shall probably see the problem solved in this way in the present generation.

THE sad disaster to the *Bourgogne*, with the lamentable loss of life attending it, would seem to point out that our large passenger liners, entrusted with the lives of so many human beings, are not as trustworthy as one would wish to see them under circumstances of collision. That such a vessel as the *Bourgogne* should founder in about ten minutes after collision with a sailing vessel, which was, it is said, not sailing at more than 4 or 5 knots an hour, and of only one-fifth her tonnage, is astounding. The watertight compartment system must have completely failed to fulfil its desired functions. This may, no doubt, have been caused by the numerous doors of communication through the transverse bulkheads, usually existent in passenger vessels, not having been closed in time, and the accounts of the disorganisation on board, if true, may go a long way to account for this. Though the speed of the *Cromartyshire* was very probably the low rate stated, as a condition of fog is not associated with much wind, we must remember the shock of collision and the damage done depended upon the resultant speed of the approach of the two vessels to one another, and that any high speed of the *Bourgogne*, if it existed, would be as detrimental to herself as if it had been that of the other vessel, so long as it was the side of the *Bourgogne* that was presented to the shock of impact. In fact, any continued movement of the *Bourgogne* across the bows of the *Cromartyshire* would probably produce a tearing action right along her side, as if she had scraped along the side of a pier. In this way many adjoining watertight compartments may have been broken into. It is undoubtedly a fact that all apertures in water-tight compartments are a source of danger, as collisions invariably happen unexpectedly, and the chances are that such apertures are not closed in time. We have still to see the ship designed which shall actually be in watertight compartments without apertures in the transverse bulkhead, and which shall still be practicable either as a passenger, cargo, or war vessel. If this result is unattainable the lesson to be read is the criminality of taking any risks as regard speed in a fog merely for the shortening of the voyage by a few hours. As apparently fog signals cannot be relied upon at sea for always giving timely notice of the approach, and particularly of the direction of approach, of vessels to one another, we think it is time that our electrical scientists should devise an indicating instrument for use at sea which should indicate by induction the approach of iron steamers one to another, and the direction of such approach. We think this is quite feasible within certain limits of distance; and such indication, being a disturbance of the normal position of the instrument, might easily make contact for the ringing of an alarum electric bell operated by a relay. By all means within the ingenuity of man to contrive, the risk of unknown approach of one vessel to another on the broad seas should be eliminated.

THE experience of the American battleships in tropical waters, such as the Caribbean Seas, has emphasised the awful strain upon the human frame required to cope at present with the duties of the stokehold. We should fear that many of boiler-room staff must have materially shortened their lives by the exhausting effort of stoking and clearing fires in an atmosphere which must have been up to 150 deg. Fah. or over. It is on record that in those tropical seas even the galley with open doors and air blowing through it was at a temperature of 135 deg. Fah., and we do not, therefore, exaggerate in our estimate of the temperature of the stokehold. It is reported that the firemen were constantly being brought up gasping and prostrated until revived by the external application of water and the internal application of stimulants. We cannot understand why such stoking, which so often must be done at extreme pressure in warfare, should not be done by mechanical stokers. There are many of such appliances well-known and tested on land boilers, where they have to hold their own by direct competition as to economy and steam-raising power with hand stoking, and where the physical relief to over-pressed humanity is not a reason for their adoption. If, then, such mechanical stokers can hold their own on economical and steam-producing grounds, how much more should the necessity for their adoption ensue where such extreme exhaustion to suffering humanity is to be relieved. This is also one great argument for the adoption of liquid fuel, which lends itself so easily to automatic and mechanical supply and regulation of such supply according to need. There is no need, however, to wait for such a revolution in fuel as that of liquid fuel to adopt mechanical stoking in the Navy. We should be glad to hear from those who have had long experience with mechanical stokers as to their adaptability to naval uses, and how far such systems as have been already tested could be guaranteed to deal with the conditions and needs of naval use.

A GOOD deal of interesting discussion has been taking place in the columns of a valued contemporary as to the modes and theory of balancing engines to remove vibration at high speeds and the controversy is extremely interesting, as showing how little is known or agreed upon in this most interesting subject. The matter is likely to be more and more forced upon the attention of engineers and scientists owing to the rapid increase of engine piston-speed at sea to meet the ever-increasing demand for higher speeds of steaming. One has only to travel in any of the newer mail or passenger steamers, framed for their high speed, to ascertain how rapidly the increasing vibration of hull, due to the beat of the reciprocating engines, is becoming a source of intolerable annoyance to passengers, and undoubtedly a serious factor in the rapid destruction of the hulls, which will soon show. In the modern high-speed torpedo destroyers the same thing is to be noticed at the extreme speeds. It is reported also that some of the new battleships and cruisers are finding the same affliction, and it is said that a new Atlantic liner, not built in this country, has developed such excessive vibration that, after running one trip, she has been taken out of service for alterations of some kind. Although the balancing of the engines in themselves is a most important part of the enquiry into this most serious and modern development of vibration, we do not think that this is the point in which the most radical amelioration may be most easily effected. We think too little attention is given by designers to the action of the hull, as a whole, as a vibrating rod, or as to the respective nodes of such impulses as may arise from the beat of the engines relatively to the hull. Where there are distinct sets of engines and twin propellers, as is now so common to all new steamers of high speed, it may be noticed that the vibration sets up in the hull a series of fluctuations from nil to maximum. Now, it is well known as the basis of the science of sound or light, which are propagated by vibrations, that two diverse vibrations of different nodes may be made to interfere and kill one another, and that where the impulses and nodes coincide the resultant effect is mightily increased. The same effect has been closely studied in the coincidence and interference of wave impulses, their conflict at times giving smooth water. This is what we want to apply to the numerous cases of extreme vibration of hulls. If, as may be noticed, there are constantly recurring periods of such mutual interference of the vibrations that stillness and quiescence ensue, it is only necessary to determine the exact condition of such periods of quiescence, as compared with the conditions of extreme vibration, to determine the conditions that might ensure a maintenance of the quiescence or relative interference of the disturbing impulses. The position of the engines relatively to the length of the hull, the coincidence of the speed of a pair of separate engines, the relative ratio of speeds which, by hunting one another, would give the fewest recurrences of mutual coincidence, and the effect of placing each set of engines in echelon to one another in the length of the hull, rather than at a single node or wave point of the hull, are all points that should be considered by the designer and the engineer, as materially effecting the resultant vibrations of the hull, where perfect balancing of the engines in themselves cannot be attained.

OUR readers will observe that we make a new departure this month and introduce three new features into the MARINE ENGINEER. The first is the Thames Notes, the second Electrical Notes, and the third Notes of the Marine Engineers. There are great and famous engineering works on the Thames, and it is our object to do for the Thames what is being done for the Clyde and the Tyne. Every large passenger steamer has now an electric lighting system, and these notes on marine electrical matters cannot but be of interest to the marine engineer. Lastly, it is the intention to voice the movements of the engineer of the Mercantile Marine in the same way as has been done for the engineer of the Navy.

THE ATLAS WORKS, SHEFFIELD.

MESSRS. JOHN BROWN & CO., LIMITED.

THE Atlas Works are situated in the Brightside district of Sheffield, about a mile from the centre of the city, and cover an area of 32 acres.

The works were originally purchased by John Brown & Co. in the year 1854, and ten years later the present limited company was formed with Sir John Brown as chairman. On his retirement Mr. J. D. Ellis was appointed in his stead and still occupies the chair, being supported on the board of directors by Mr. C. B. Maclaren, M.P. (deputy chairman), Mr. Charles E. Ellis (managing director), Capt. T. J. Tresidder, C.M.G., Lieut.-Col. J. G. S. Davies, and Mr. J. E. Townsend.

Messrs. John Brown & Co., Limited, were the first to take a licence from Sir Henry Bessemer for the manufacture of steel on his process, and they soon introduced Bessemer steel rails, tyres and axles, which have since been used by all the leading railways. Although a large business is still done in railway tyres and axles, the Bessemer plant has recently been dismantled to make room for extension in the armour-plate department. The firm's armour-plate manufacture commenced in 1859; they may, therefore, be considered the pioneers of the armour-plate trade of this country. The manufacture began with wrought-iron plates rolled to four inches in thickness, afterwards increased to 24 inches. In 1877 the company started the manufacture of compound armour on a system patented by Mr. Ellis, and from that date until 1893 this class of armour was adopted in the construction of the largest battleships and cruisers, both for this country and abroad.

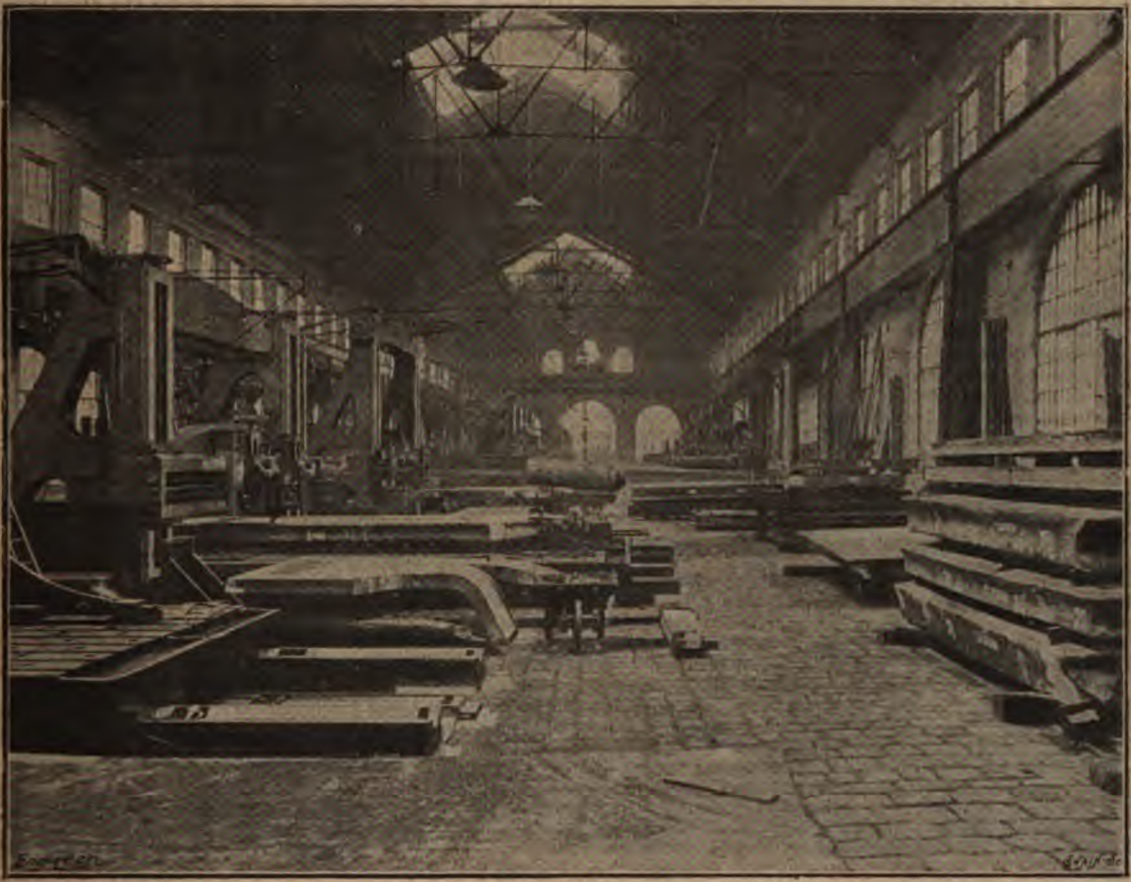


FIG. 1.

At the present time steel armour alone is being supplied for the protection of battleships and cruisers, and John Brown & Co., Limited, were the first to produce armour plates with faces of the excessive hardness now considered indispensable. Fig. 1 shows the armour plate planing machine shop. Their patents, which have reference to the final or chilling stage in the manufacture of hard-faced plates, and are known as the Tressider patents, have been acquired by the Harvey Company and incorporated with the Harvey and Krupp processes. The efficiency of the plates being increased has allowed of the reduction of the plates to about one-half the weight. Considerable additions have been made to the plant in order to allow the company to produce their estimated output of 10,000 tons. Electric plant has already been installed, and all the machinery will soon be driven with separate motors.

The armour plates are made from ingots cast from large Siemens furnaces in special moulds, and weigh from 30 to 50 tons.

In the case of plates not exceeding about 9 inches the ingots are pressed into flat slabs, in the forging press department, where two large and powerful hydraulic presses, exerting a pressure of 4,000 and 10,000 tons respectively are erected, and, after pressing, are rolled to finished thicknesses in the rolling mills. For thicker plates the slabs are pressed by the larger press to the finished thickness, and rolling is dispensed with. These presses are also used for marine shaft forgings, &c. One of these presses is shown in Fig. 2.

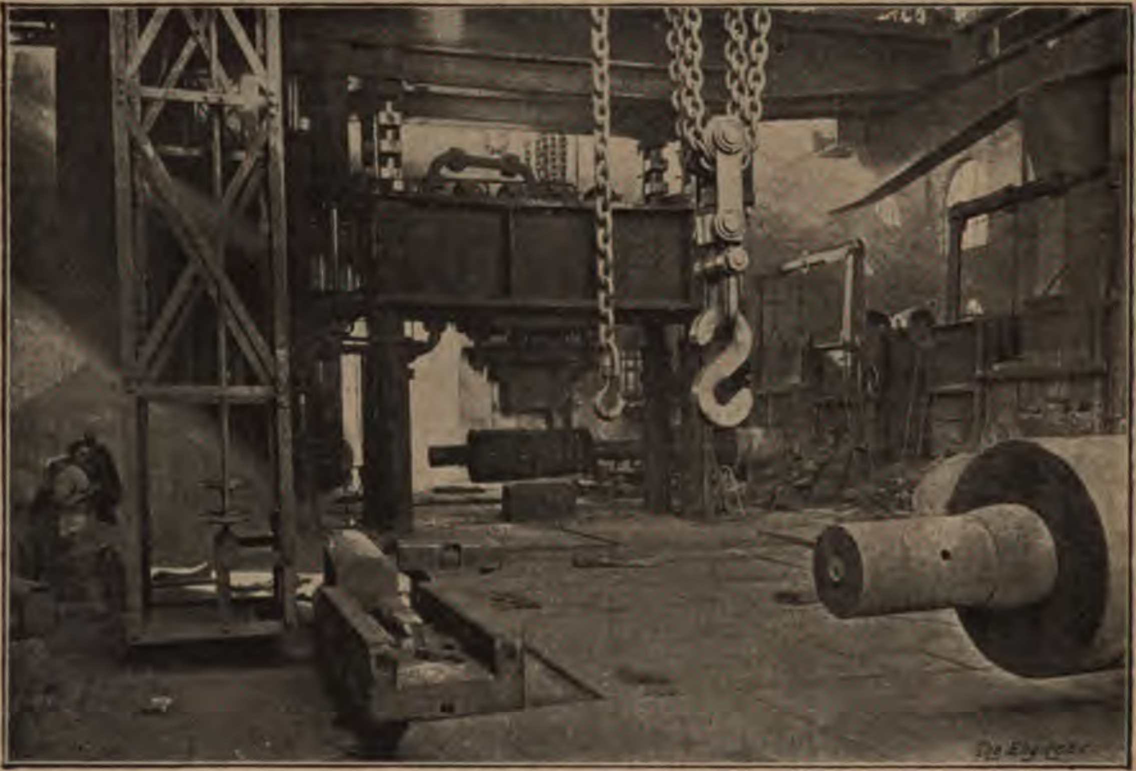


FIG. 2.

The "Purves" patent flue shop, with its interesting special machinery, was commenced in 1887 and occupies the site of a large iron forge. These flues have been received with favour in all parts of the world, and the demand has been a constantly increasing one. The success of the "Purves" flue, however, is likely to be diminished by the one recently patented by this firm and known as the "Brown's Combined Flue."

The "Serve" tube is one of the specialities taken up by the company, and has led to a very important improvement in use both on sea and land.

The company have three blast furnaces, two of which were completed and blown-in during 1872 and the third in 1874. They are capable of an output of about 1,000 tons per week, and the ore is principally brought from the mines belonging to the company.

The number of hands employed at the Atlas Works is about 4,000.

Messrs. John Brown & Co., Limited, are also proprietors of extensive coal mines in the neighbourhood of Sheffield known as Aldwarke Main, Car House and Rotherham Main Collieries, raising 6,000 tons per day of steam, gas and house coal, and giving employment to about 4,000 men and boys.

The Ellis and Eaves induced draught department has been placed under the charge of Mr. Wallace, formerly of Blackwood & Gordon, of Greenock. He has lately introduced many considerable improvements in the construction of the arrangements. The old arrangements provided tubes along the top of the boiler 10 ft. in length. Through these tubes D the air was drawn and it descended down the space F to the furnace door casing. This old arrangement is shown in Fig. 3. In the new arrangement the tubes are in the smoke-box, and vertical, and only 5 ft. 3 in. long. It will be noticed that the air to be heated and used for combustion in the old arrangement comes straight through the tubes from the back, through the tubes round which the escaping gases are circulating. The air then bends down to the fire, to the combustion chamber at the back, through tubes B, circulates round tubes D, and up the uptake round to and through the fan. Altogether there are seven bends, and much resistance to the motion of the air in consequence.

In the new arrangement there is a diaphgram DD, Fig. 4, about one-third of the way down the tubes and at right angles to them. The tubes go through this diaphragm, and the holes in the diaphragm through which the tubes go are larger than the tubes, so that round about the tubes are littler annular spaces shown in plan CC, Fig. 5. The air is drawn in from the sides above the diaphragm, then passes through the annular spaces shown at CC, and circulates about the tubes under the diaphragm. To prevent this air from passing from the annular holes straight to the side baffle plates BB are put in vertically so that the air requires to go down under the diaphragm before it can get to the side. The mouth-piece of the furnace has two side flap valves EE. There are also flap valves leading from the air-chamber to the ash-pit. On the top there are three valves FF.

When the top valves are shut the air is allowed to go below the fires. When the two valves at the sides and the slide valve at the top is open all the air is admitted to the top of the fires. By this means a perfect conbustion of the coal, whatever kind it may be, is gained.

There are holes in the ash-pit for cold air, and there is always an admission of cold air below to keep the bars cool.

In the marine type the axis of the fan is kept in line with the axis of the boiler. Since the speed is 450 revolutions, this prevents any injurious action against the bearings due to the gyroscopic action of the fan.

The fan in the new arrangement is placed under the funnel. When the draught is equivalent to $2\frac{1}{2}$ in. water, the percentage of energy given to the fan is $1\frac{1}{2}$ per cent., but when the draught is about doubled, say 5 in. water, about 6 per cent. goes to work the fan.

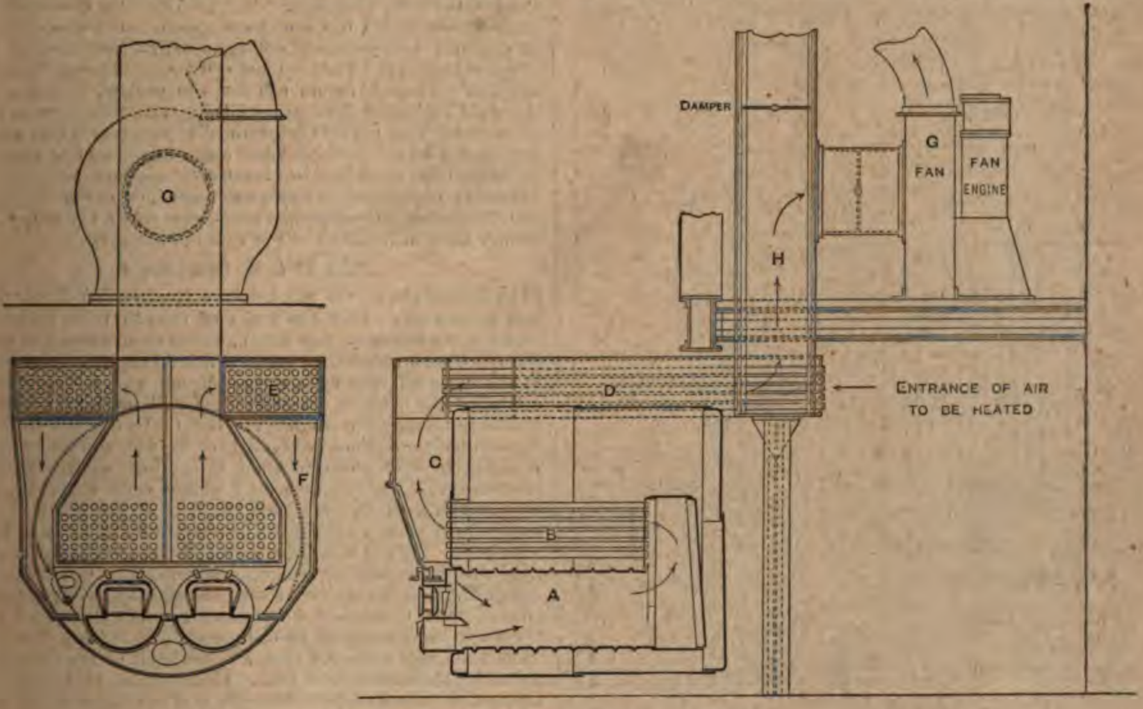
In cases where the induced draught is for electric lighting stations the fan is usually driven by a motor, in other cases the driving power is by the engine. When it is an engine it is placed in the engine-room out of the dust of the smoke-box. The tubes are of wrought iron and 2¾ in. diameter.

At the present time there are 40,000 H.P. on order. The Bradford Electric Lighting (two extensions) have been fitted up. One extension of the Sheffield Electric Light and Power Station, Charing Cross Electric Supply, and one extension Hampstead Electric Lighting Station.

The system has been adopted by Messrs. Denny of Dumbarton, and fitted in the *Southwark*, and by J. G. Thompson, of Clyde Bank, and fitted in the *Kensington*. They are twin-screw sister ships, 480 ft. long by 57 ft. wide by 40 ft. deep. The main engines are quadruple expansion, intended to develop 7,000 I.H.P. in each ship at trial.

The *Southwark* has been running from Liverpool to Philadelphia with an average combustion of 27½ lbs. per square foot of grate.

The *Perthshire* and *Buteshire* have also been fitted. On the home voyage from Australia the *Perthshire* averaged 31½ lbs. of coal per square foot of grate on fifty-nine consecutive days.



Ellis and Eaves Induced Draught. Fig. 3.

In conjunction with this Messrs. John Brown & Co. often fit into the boilers the Serve tube, which they manufacture. Conductor pins, fixed into the heating plate and projecting into the space traversed by the flames, aid greatly in the more rapid transmission of heat from the hot gases to the water. An experiment was made to demonstrate the advantages of conductor pins. Three tin boilers were taken, one without conductors, one with conductors on one side, and a third with conductors on both sides, and they were heated by means of large laboratory gas burners. In each of them was put 22 lbs. of water, and the same amount of gas, 30 cubic feet was consumed in each experiment, lasting two hours and forty minutes. The evaporative result was—

	Water evaporated.
Boiler 1 (without conductors)	4 lbs. 14 ozs.
,, 2 (conductor on 1 side)	7 lbs. 14 ozs.
,, 3 (conductors on both sides)... ...	8 lbs. 5 ozs.

The serve tube manufactured by Messrs. John Brown & Co. has a section like that shown in Fig. 6, and the gases go through the inside of the tube, the water being on the outside. The inward ribs expose a greater amount of heated surface and more heat is transmitted to the water, which allows a greater efficiency. Mr. Ellis found that the Serve tube gave an evaporation of 16·8 lbs. per square foot of heat-distributing surface. When the *Iona* was fitted with Serve tubes the coal burnt was 45 lbs. per square foot of grate, as against 22½ with the former plain tubes.

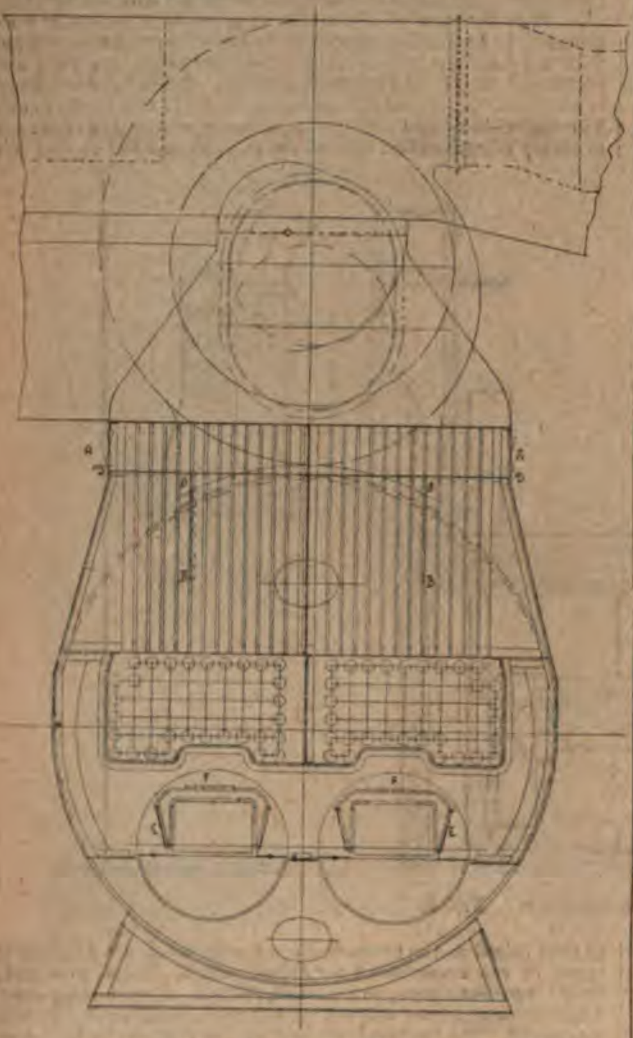
THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The Loss of "La Bourgogne."

THE awful disaster which occurred on the 4th July has certainly been the event of the month as far as this column is concerned. The amended lists seem to show that by the collision with the Glasgow sailing ship *Cromartyshire* no less than 565 persons on board *La Bourgogne* perished. These were composed of 88 saloon passengers (all the complement in this department), 113 second-class and 246 steerage, together with 118 crew. A great cry of indignation against the steamer and her owners was at once raised in the press, and some writers did not hesitate to speak of the *cowardice of the French sailors*. Those who made such suggestions were, to my mind, foolish. French ships carry a full complement of officers, yet not a single officer of the deck was saved. The captain remained at his post on the bridge to the last. Even the descriptive writers dwell on the anxiety to save others, and this with disregard for his own chances of safety, shown by the second officer. The point as to the relative proportions of crew and passengers who eventually found their way to the *Cromartyshire* loses its force when we remember how short a time elapsed between the collision and the final scene, together with the hour at which the occurrence took place. All the passengers at such a time would be in their bunks, and many of them were probably only aroused by the rising waters. Others would be too dazed to do much for their own preservation. The whole training of the seaman tends to fit him for such sudden emergencies. Panic there seems to have been, and terrible scenes enough were enacted. But as far as evidence goes the low-class steerage passengers were responsible for this—not the crew. Possibly if Captain Deloncle had used his revolver when the first rush by the Italian passengers was made he might have stayed the panic. But could he have added much to the roll of the saved?

Several boats seem to have been destroyed by the collision, and there seems to have been no chance to make a second journey with any of them, even if the heel of the vessel would not have prevented the lowering of those on the port side. Nonsense has been talked, too, about the bulkheading of French ships as compared with those under other flags. The fact is that if *La Bourgogne* were really holed in three compartments no bulkheads as applied to passenger ships to-day could have kept her afloat. For end-on collision the present system is good enough, as the experience of the *Cromartyshire* in this case shows. Some arrangement of longitudinal bulkheads in the wings is the only possible preventative for foundering when a vessel is struck time after time in the large midship compartments.



IMPROVED SYSTEM OF INDUCED DRAUGHT. FIG. 4.

La Bourgogne was built in 1885 by the Forges et Chantiers de la Seyne. She had only just returned to duty after a very expensive and complete overhaul, which included new boilers and triple-expansion engines in place of her original compounds. Her value is put at something like £250,000, owing to this recent expenditure, and her loss will be a heavy blow to her owners, who have so recently had the misfortune to lose the steamships *Ville de St. Nazaire* and *Flachat*.

Changes in the Fleets.

It has for some time been recognised that the year 1898 will see a phenomenal amount of tonnage, especially of the largest and best steamers added to the register of the British Mercantile Marine, and, it might be added, to that of Germany also. This is, of course, largely due, in the case of our own vessels, to the repression which the disastrous strike of last year, brought about. But another feature seems to have been introduced recently. This is the immense transfers of existing tonnage which have taken place between the fleets themselves. The main origin of this movement has been the Spanish-American war. It is needless to mention many of the minor transfers, or indeed, since we have already discussed it, the important absorption of the American Line Mail boats by the American Government. But the latest noticeable taking-over has been that of a squadron of seven fine cargo boats from the Atlantic Transport Company. These included the pick of their fine fleet. The company was, of course, paid in cash. But it did not retain its takings. It promptly bought up the five new 8,000-ton steamers of the rival Wilson-Furness-Leyland Line between London and New York. Thus at one stroke it provided itself with ships which are certainly economical, of immense capacity, and thoroughly well advertised in passenger circles, and at the same time got rid of its most formidable opponents, who moreover bound themselves to steer clear in future of the Thames and Hudson traffic. A smart piece of business enough, and one that was no doubt equally satisfactory to buyer and seller. But the war will not last for ever, and one is brought to ask oneself, "After the war, what then?" The American Government will have no use for all the merchant steamers it has now employed as cruisers, transports and colliers. Will it keep them? Hardly, one would think. Then it must sell them. It may find that the original owners have no use for the vessels, having—like the Atlantic Transport Company—filled up the vacant space by fresh purchases. Then, if it is determined to sell, it will find an outside buyer, and he will have, in some trade or other, to compete with existing lines or with now lucratively engaged tonnage. This excessive replacement of tonnage rented, or apparently sold, to the American Government, must eventually lay ships up and reduce rates of freight and the value of shipping.

The P. & O. Company's

ill luck continues. On the 1st July the steamer *Ganges*, which was appointed to take the mails of the 9th from Bombay, was burnt in the harbour. The wreck, which was beached at the time, has since been floated and sold for 90,000 rupees. The evidence at the court of inquiry is not published and, avoiding the precedent of Sir Thomas Sutherland, I will not now comment on the mere telegraphic summary. Let us be content to say that the company could not be blamed for the fire, and let us cordially sympathise with them in their loss. But whilst doing so it cannot but be noticed that they pursue very curious methods. The Indian mail is, or should be, one of the most important which flows between the heart of the Empire and one of its chief members. Yet the *Ganges*, a vessel of comparatively small tonnage and of considerable age, was appointed to take it on the date named, and that under the new and ostensibly severe contract. The Government here has not left the speed of mail transit to be determined by competition, as it is on the Atlantic. They have said such and such a speed shall be the rate at which the mails shall cross the seas. Competition is killed by the amount of the subsidy which the P. & O. receive at the hands of the Government, and yet the Bombay mail was to be carried by the *Ganges*, a vessel next in turn to be sold out of the fleet as unsuitable for any of their services. Surely some of their liners are slow and unexacting enough for very aged vessels.

The Castle Company

is making a new issue of capital under the scheme recently put forward in view of the rapid extension of its fleet. The issue of July, 1898, was £240,000 worth of preference shares paying 4½ per cent. interest. This security, with the dividend-paying ordinary capital behind it, was of a kind very likely to tempt investors. Especially so when they see that the money is being so judiciously applied in the extension of the earning power of the fleet. For the *Carisbrooke Castle* had hardly got to the Cape before the next new liner, the *Braemar Castle* passed her trials satisfactorily, and already the new and much finer mail boats are within a measurable distance of launching.

A very old Liverpool firm

and one that is very highly respected, has just taken advantage of the Limited Liability Acts. Messrs. T. & J. Brocklebank are the firm to which I allude. They have only within comparatively recent years taken to steam, but I mind the time when nearly a hundred sail of clipper ships flew their house flag. Their steamers have been fine ones, and have done well in the Eastern trade. But it does not appear that there is any immediate intention of admitting the public to any share in the adventure.

The Fast Canadian Service.

It is reported that the suggested service between French and Canadian ports is altogether off. It is also noticeable that there is considerable delay in the publication of Messrs. Petersen, Tate & Co.'s company which is to work the Canadian Mail contract to British ports. It certainly hangs fire. People say it is "postponed." Whether the postponement is *sine die* or not does not appear. But I should not be surprised if it were too big a burden for those who have hold of it.

"The Isis,"

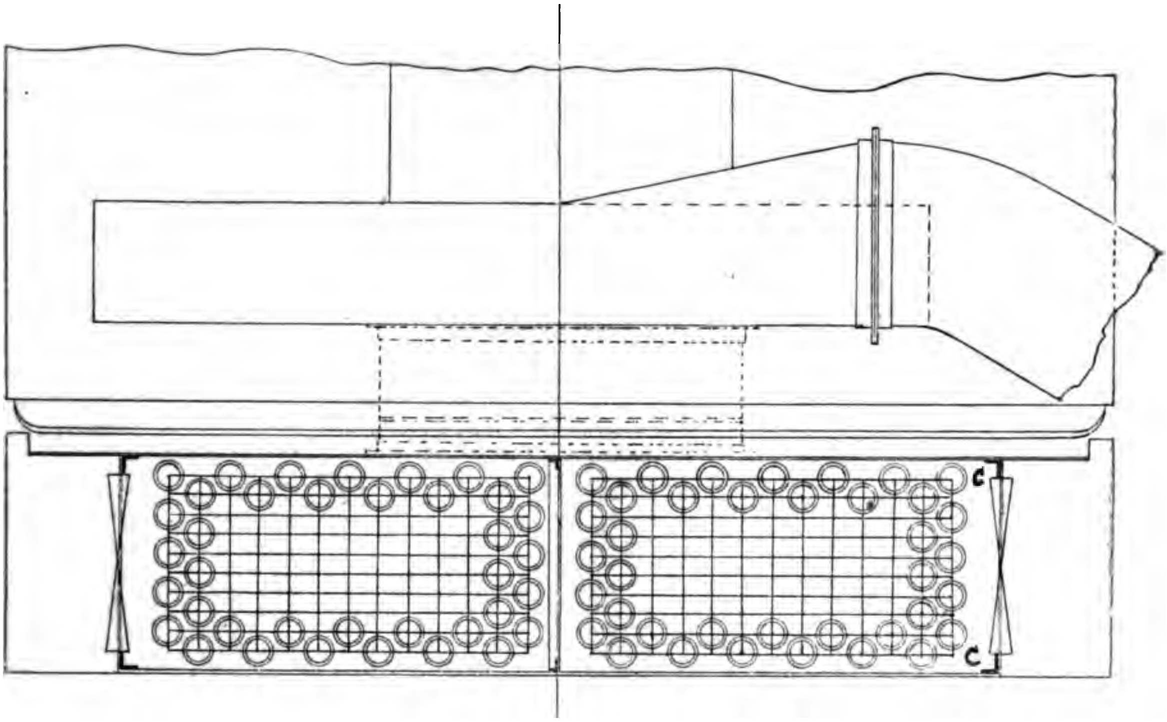
first of the pair of high speed mail boats for the Brindisi-Port Said service of the P. & O. Company, got to work in July, and I presume she will be able by herself to carry on the work till her sister joins her. Thus the final desertion of Brindisi by the big Indian and Australian mail steamers of the line has finally come to pass; and come because Marseilles offered inducements to the line to go thither, and Brindisi refused to advance with the march of improvement elsewhere. I have just been reading a report by the British Consul at the Italian port for the year 1897. He says, "No works have been undertaken in the harbour, although during the year great pressure has been brought to bear on the central authorities to cause the works to be taken in hand." It will be useless now to continue that pressure, for the time is past. The branch steamers of the *Isis* class are of small tonnage and of small dimensions, though of great speed, and they will easily find accommodation in the port. But the big steamers—and the bulk of the traffic—are gone to Marseilles, and Brindisi will find that opportunities of this kind once gone are very hard indeed to recover.

The P. & O. "China"

has found occupation for the salvors now for four months. They have worked patiently and steadily, whilst the rate for re-insurance has remained very passive at 70 guineas per cent. By the middle of July their Herculean labours appeared to be near an end, for the rocks on which the vessel lay had by this time been so blasted away that access to the wounded plates was obtained and temporary stoppings were effected. All the available pumping power was got to work, and an effort to float the big ship made on the 19th. But it failed. A laconic telegram in the *Shipping Gazette* attributing this to the fact that the pumping power was ineffective. This was subsequently explained by a statement that fresh damage to a large extent had been discovered in the forepart of the vessel, and that the dealing with this would necessitate further blasting and much delay. One begins to think that even these patient salvors will begin to feel some discouragement.

The "Candia,"

of the P. & O. Company's cargo service, has just given Sir Thomas a fine example of the value of the twin-screw principle. She is one of the pair of big cargo boats which, till the launch of the *Isis* and *Osiris*, boasted of being the only vessel in the fleet fitted with duplicated machinery. Homeward bound from the East, this vessel broke a shaft and dropped a propellor soon after leaving Colombo in the latter part of June. But instead of drifting, as one of the big passenger and mail boats of the line would have had to do, till some benevolent vessel large enough and willing enough to tow her into any port came along, she simply preceeded at reduced speed on her voyage. She reached Aden in due course, reported what had happened, and proceeded for England, where repairs could be executed far more cheaply than in the East. At the same time delay was minimised, expense of transhipment avoided, and last, but not least, the payment of a salvage award was escaped.



IMPROVED SYSTEM OF INDUCED DRAUGHT. PLAN, FIG. 5.

The New Zealand Shipping Company

are gradually getting rid of the five boats with which they made their entry into the steam trade between the Antipodes and this country, and with which they for so long maintained a monthly mail and passage service. The *Ruapehu*, it will be remembered, left the service when she undertook the big tow of the Spanish floating dock to Cuba from the Tyne. The *Aorangi*, re-fitted and improved in her machinery department, made a not very lucky (to poor Messrs. Huddart at least) addition to the Vancouver-Sydney service. Now the *Tongariro* goes. She is sold to the Beaver Line, and commences work for the new owners early in August, taking the place of the *Lake Winnipeg*, which is on sale. The *Tongariro* is a 4,000-ton boat, built 15 years ago in the Fairfield yard, and is in every way more fitted to run with the *Gallic* in the mail service than the older and smaller steamer which she replaces.

Messrs. Elder, Dempster & Co.

have sold a fine twin steamer, the *Monmouth*, to the Dominion Line. The vessel is in one point exceptional. She was built at Queen's Island, but unlike all their recent output her builders did not engine her. She was taken across to Liverpool, and there fitted with machinery by Messrs. Geo. Forrester & Sons. She is a fine large vessel, and quite worthy of a place in the modern fleet of her new owners. The liner *New England*, by the way, has done well on her maiden voyage, accomplishing both the outward and homeward trips between Queenstown and Boston under the seven days.

Captain Deloncle,

Of the ill-fated steamer *La Bourgogne*, had been selected to command *La Lorraine*, the first of the new fast vessels, which, under the French mail contract, are to be at work by the year 1900. The keel of this steamer is laid and all progress possible is being made with her. She, like her sisters, is being built at her owners' yard.

The Cunard Company

have, it is reported, disposed of the *Scythia* to the United States Government for use as a hospital ship. She is an iron screw steamer of 4,500 tons, built by Messrs. J. and G. Thomson in 1874, and is still fitted with her original compound engines. For many years she and the *Bothnia* were the favourite vessels in the company's service to New York. Even the advent of the *Gallia* did not seem to diminish their popularity. But for ten years the pair have not been seen in their original service. They have been running to Boston, and latterly they have been employed but occasionally. The *Bothnia*, for example, not having been out since November, 1896, except when she was chartered to go to the Spithead Review with a party of excursionists. The *Scythia* will be chiefly remembered from her adventure with the whale off the Irish coast. On that occasion she received such damage that it became necessary for her to put back. There are several other Cunarders that might very well be disposed of at this favourable juncture. Especially might be named the *Samaria*, built in 1868.

SERVE TUBE. *FIG. 6.

The Compagnie Transatlantica

has lost two vessels since my last Notes were written. One was *Antonio Lopez*, so named after the founder of the line. She was built in 1881 by Messrs. Denny & Co., at Dumbarton. She ran ashore off the Cuban coast, and her wreck was burnt by the blockading Americans. A newer and larger vessel was the *Alfonso XII.*, also lost in the same neighbourhood, and in much the same way. She attempted to run the blockade of Havana. Three American cruisers headed her. Then she tried to run into the nearest harbour and was again confronted by some of the blockaders. Finally she ran ashore and the American shells set her on fire. She was a vessel but ten years old, and of upwards of 5,000 tons gross register. Now the company is being in some way recompensed for its losses, and that by the Americans themselves. When Santiago surrendered the Americans promised to see that the Spaniards who laid down their arms to them should get safely back to Spain. For the conveyance of these men, numbering some 25,000, the American Government invited tenders. But the contract was not in any way divided, and so only large shipowners could possibly attempt to fulfil the conditions. The British and German lines tendered at a price of 110 dollars per officer, and 55 dollars per man. The Compagnie Transatlantica asked but 55 dollars per officer and 20 dollars per man, and their tender was accepted. The whole of this army is to be shipped off by the middle of August. Only a very large and well organised concern could hope to carry out such work in the time. But it may be remembered that the company's vessels were many of them employed in taking the troops out to Cuba, and that therefore they are well experienced in the work of transport, and probably still have many vessels with their fittings aboard. The contract involves the payment of considerably more than a hundred thousand pounds to the company by the United States, and it seems strange indeed that such an arrangement should have been made with a hostile power, and one which is at the very time the agreement was made, burning and destroying the other vessels of the line.

SWEETING'S BOAT DISENGAGING GEAR.

THE recent disaster to the Atlantic liner *La Bourgogne*, entailing such a deplorable loss of life, again brings the matter of boat disengaging gear prominently before us. It would appear from the accounts given that the loss of life would have been much reduced had the ship's boats been readily and expeditiously launched immediately after the collision, but which for some reason could not be effected.

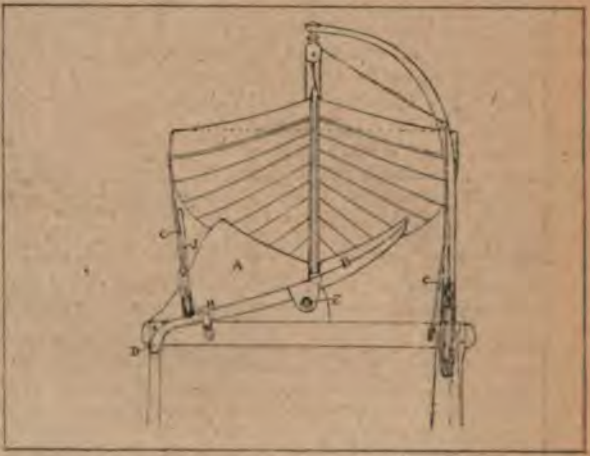


FIG. 1.

We illustrate in the adjoining diagram a new type of boat disengaging gear, whereby the boat is fully and well secured in chocks and made fast by bands and grips, and can be released simultaneously at each end in less than five seconds, and is then immediately ready for lowering away into the water.

It will be seen that the plan is simple and efficient, yet without the risk of anything getting out of order, as there are very few working parts, and these are put together in such a way that they are not liable to become set fast by corrosion, as so often happens with many devices that have been fitted heretofore.

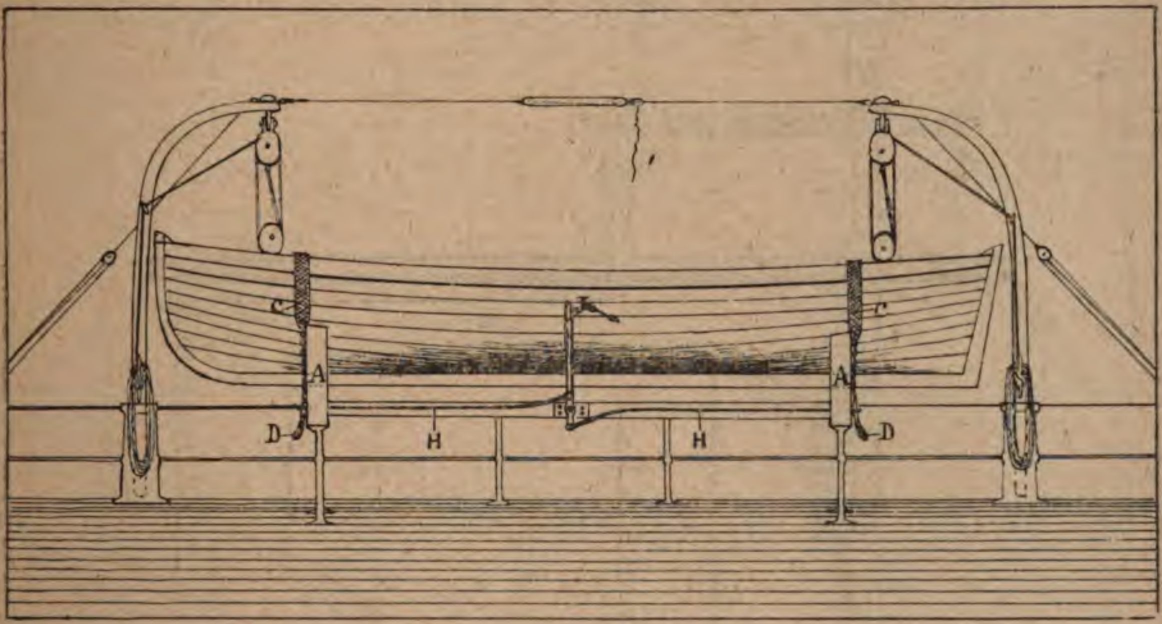
It will be seen from the diagram, of which Fig. 1 is an end elevation and Fig. 2 a side elevation of a boat, supported in Mr. Sweeting's device, that the inboard chock A is fixed, while the outboard chock B is attached to a lever D, mounted on a spindle E, and is capable of being lowered out of normal position. The boat is held down in place by bands C, the lower ends of which are engaged by bolts H. A lever J is pivotted on the cross-bar, to which are connected releasing bolts H' H', which are adapted at the ends to engage the levers D, in order to maintain them in their normal condition for supporting the boat.

The great features of the device are its simplicity and the absence of necessity of lifting the boat as is generally the case. The operation of releasing the boat is as follows :—The lever J is first pulled, which releases the bands C and levers D, and consequently the chocks B fall away from the boat's bottom and the boat is free to drop 3 or 4 inches until her weight is taken on the tackle falls ready to be swung out over the water.

The apparatus has been fitted in the ss. *Cora Maria*, belonging to Messrs. R. Gordon & Co., of London, and it is interesting to note what Captain Bullock, of this ship, has to say with reference to the device. He states in a letter to the owners that, "I have given Sweeting's boat disengaging gear a good trial, and I have found it to work exceedingly well, and a great improvement on the old style. In fact, cannot say too much for it, as the patent itself works so lightly that a child of ten years may work it. It is certainly worthy of the notice of all shipowners and shipbuilders."

This is valuable testimony as to the merits of the device, and should carry weight with those who are interested in this class of apparatus.

In conclusion, we may add that the invention has been made by Mr. F. J. Sweeting, Marine Surveyor, of 23, Rood Lane, London, E.C., who has had considerable experience in boat lowering and disengaging in a seaway, having served in his younger days for two years on board a whaling ship in the South Seas.



SWEETING'S BOAT DISENGAGING GEAR FIG.

THE NAVAL ESTIMATES.

THERE has been considerable grumbling on the part of the men composing the British Navy in consequence of an attempt on the part of the Government to annul their right to long service pensions. The wages of seamen in the Navy are in no way great, as it has been understood—seamen understood—when they enlisted that they would be entitled to long service pensions. The idea is so old. It has always been understood that the British Nation would keep its promise. Legally, it is said, no contract exists that the Greenwich age pension should be paid. The Government are backing out on the plea that the pension was a charity. Even Mr. Chamberlain, who has done so much to forward the movement for old-age pensions universally in England, has based his defence on the attitude taken up by Government by saying: "If it be admitted that this was a charity." It is not admitted. The men joined believing that the pensions were their right. They claimed that they were promised rations and wages, and a long service pension of 5d. per day at 55, and an extra 4d. per day at 65. But they have even a stronger claim than this. Every seaman who joined the service had the traditions of Greenwich Hospital in his mind. He believed that after a long, active, confining service for his country that his country had provided that for him in his old age. It was said that the Act of 1878 had annulled any rights he had to a pension. Whatever the Act of 1878 made law men enlisted under the conviction that they would get a pension. The pensions have been paid. They are not charities. The pensions of the State to seamen are deferred pay.

More and more it is being borne in on the mind of the nation that their first line of defence is all important. Year by year it is becoming more necessary to strengthen this line of defence. Much of the strength of the Navy, nay, almost all, depends on the spirit of the men. A spirit of discontent in our first line of defence cannot be a factor of strength. Yet the Government in breaking faith with the seamen are creating a spirit of discontent. These wounds must be healed. It will not do even i times of peace to promote a spirit of discontent. Greenwich Hospital belonged to the seamen of the English Navy, and whe it was taken away from them and converted into a college they have a just claim to something in its place. These old-ag pensions are therefore theirs by right.

The Estimates for shipbuilding show £10,801,000 put down t vote 8. Of this £5,189,000 are set down to be spent in the Roy Dockyards, and £5,612,000 upon contract work. In vote Naval Armaments is given £2,584,000.

OWING to want of space we are compelled to hold over Board of Trade Examinations, part of Patent List, and Naval Engineer Appointments, &c.—ED. *M.E.*

The rule of "normal expenditure" is that of the Navy. It is not the requirements of the service, nor what it has to do which is studied; but the guidance for expenditure is bound by what was spent last year and the year before. The Navy indeed is subject to wirepulling politicians, and its necessities are measured by what they allow to pass through.

Mr. McHardy, who has had much to do with the service, has brought the matter very freely under discussion. He considers that the necessities of the service ought to be shown by the answers to the questions. What are the ships of each class—their age, displacement, speed, and armament—which each nation has afloat and building? Secondly, relatively thereto what does the naval adviser to the First Lord consider necessary for the British Navy? Thirdly, by what number of ships are we short of that standard? Fourthly, within what period is it proposed to make good the deficiency? During the year 1889 a Commission sat, presided over by the Duke of Devonshire, to enquire into the necessities of the Navy, and only in that year were these questions answered. If graphical means were taken to show the progress made in the Naval Armaments of each country, it would be clearly evident that though France and Russia were represented by nearly straight lines, the curve for this country would appear very erratic, sometimes high, at other times very low.

Last year it was low, due to the engineers' strike. The First Lord says in consequence of that we fall short by 2¼ millions. One never knows what will happen. Russia and France are jealous of this country, and probably would join their Navies to attack ours. It is certainly necessary to consider the conditions under which the English Navy would require to meet the Navies of Russia and France. And our Navy must be always ready to protect our trade, which is the life blood of England. In the East our sea-borne commerce is three or four times that of both countries. It is to be trusted that the nation will rise to a sense of the necessities of the Navy and lay down definite rules of progress in consonance with its necessities rather than bind it over to be in this as in former years.

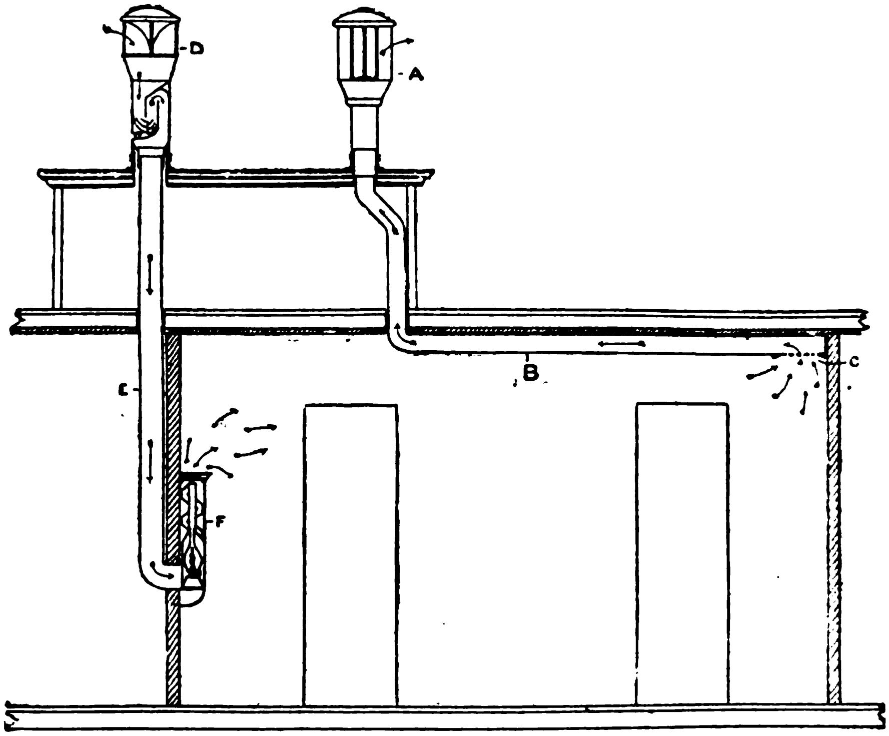
A New Harbour is to be made on the Southern shore of the Gulf of Finland, which will serve as an outer harbour to the commercial port of St. Petersburg.

VENTILATION OF THE "FRAM."

MOST of our readers are aware that the now historic vessel the *Fram* started on June 24th from Christiania on a second expedition to the North Pole under the leadership of Otto Sverdrup, who was captain of the vessel during Dr. Nansen's expedition.

We understand that considerable alterations have been effected in the *Fram* which have made her much more comfortable and seaworthy than when she first set out for the Pole five years ago.

The upper deck has been converted into the main deck, and is entirely roofed in by a new flush deck. The saloon, which is some 18 ft. square, is situated forward. Special provision has been made for the ventilation of this part of the vessel, which is effected by the "Boyle" system of ventilation, originally designed for the *Fram* by Messrs. Robert Boyle & Son, ventilating engineers, of London and Glasgow, to whom we understand Dr. Nansen at that time wrote as follows:—"I am convinced that your ventilating system will prove to be of the utmost value in those regions, where the ship for years will be our dwelling, and where, of course, good ventilation is *conditio sine qua non* for our health and sanity."



The arrangement of ventilators as now fixed is shown in the adjoining diagram, from which it will be seen that A is the Boyle's patent "air pump" ventilator, which as an up-cast device to withdraw the foul air by the extraction shaft B, led to the end of the cabin, where the foul air exit C is situated. The fresh air is taken in by the Boyle's patent down-cast ventilator D through the down-cast shaft E into the Boyle's patent fresh air warmer F, from which it issues into the cabin.

On the *Fram*, as altered, the ventilators are fixed on the flush deck so that the wind can reach them freely and unobstructively from every quarter, thus ensuring their efficient action with the wind blowing from any direction.

THE MUMFORD BOILERS.

TWO or three questions have been asked of the first Lord of the Admiralty in the House of Commons as to the trials of the boilers constructed and fitted in Her Majesty's Cruiser *Salamander* by Mr. A. G. Mumford, of Culver Street Works, Colchester. The questions and replies have created an interest in the country, and the results have been waited for by those interested in the water-tube boiler question with considerable anxiety.

These boilers, of which there are four, have each 2,000 square feet of heating surface and 45 square feet of grate, were designed to develop collectively 3,500 HP. under forced draught.

The trials were of two kinds. First an eight-hours trial with natural draught, and second a full-power run of three hours. In the first the I.H.P. developed was 2,575, and in the second 4,114, which was far in excess of the specified number. The latter was obtained with an air pressure in the stokeholds of 2.6 in., the vessel attaining a speed of 20 knots. The consumption of coal was 70 lbs. per square foot of grate, and the evaporation from and at 212 deg. per pound of coal was 8.16 lbs.

In addition to the boilers a complete set of auxiliary machinery has been fitted, consisting of four forced-draught fans 6 ft. diameter driven by specially designed engines; two main feed pumps, and two auxiliary ditto with steam cylinders 9 in. diameter, pumps 6½ in. diameter, with a stroke of 9 in., of the vertical duplex type (Mumford & Antony's patent), and four specially-designed feed-water regulators, for the purpose of automatically ensuring a constant and regular supply of feed-water to the boilers.

The trials have just been completed, and they passed off with complete success, not a hitch occurring.

SAMPSON POSTS FITTED WITH OUTRIGGER OR BAR.

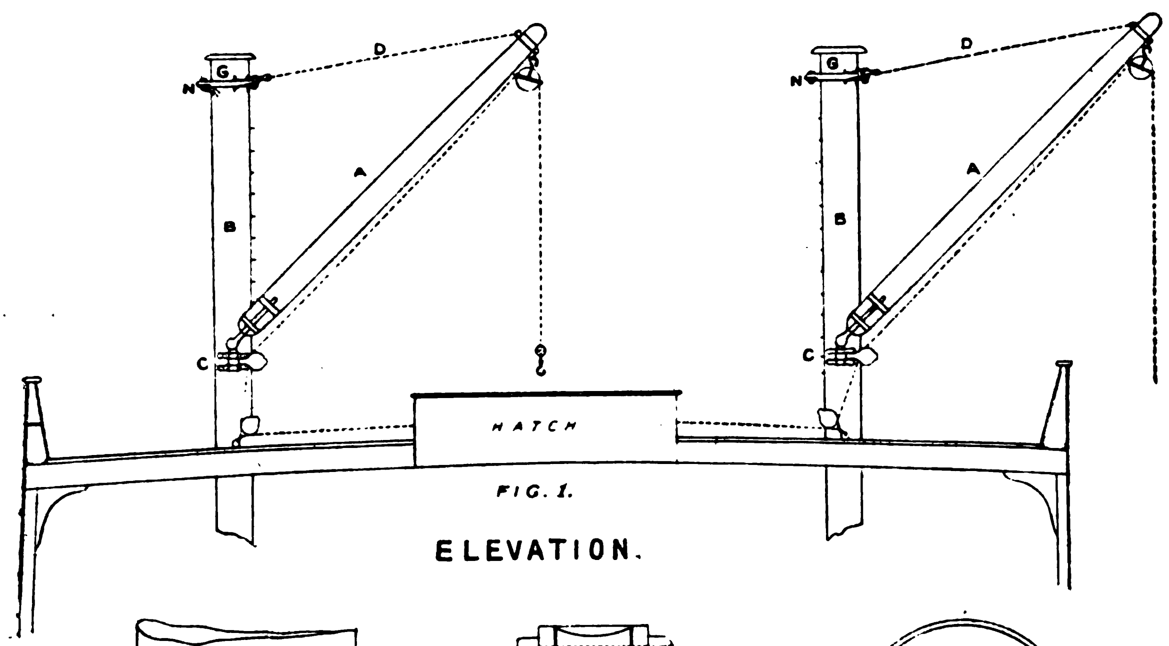


FIG. 1.

ELEVATION.

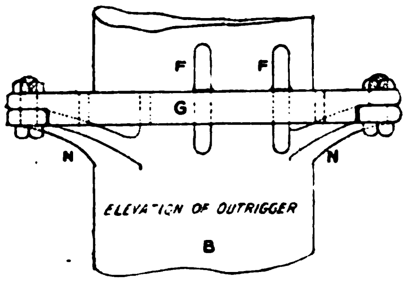
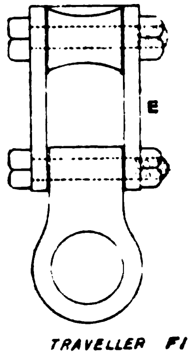


FIG. 4.



TRAVELLER FIG. 3.

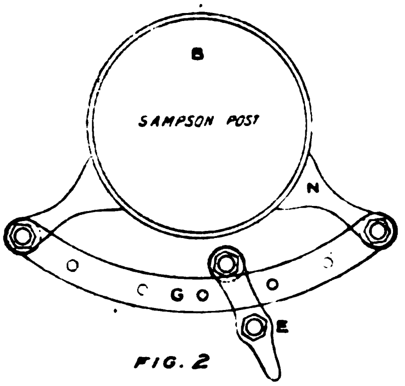


FIG. 2

PLAN OF OUTRIGGER OR BAR

PLAN

THE HUTCHINSON AND NEWTON AUTOMATIC DERRICK.

THE British India Steam Navigation Co. have brought round to the Royal Albert Dock for their cargo trade two new steamers, sister ships, the *Umta* and the *Ula*. Both are for the Indian coast service. They have been built to and classed 100 A1 at Lloyd's. The *Umta* was built by Messrs. Stephen & Son, Glasgow; and is 410 ft. long, 50·7 ft. beam, 28·7 ft. in depth. Her engines are triple expansion, and the cylinders are 26½ in., 42 in. and 66½ in., with 51 in. stroke. The *Ula* was built by Messrs. Denny & Co., and is 410 ft. long, 50·7 ft. breadth, and 29 ft. depth, while her engines are triple-expansion with cylinders 26½ in., 42 in. and 66½ in., with 51 in. stroke. The chief engineer, Mr. Paterson, showed our representative over the engine-room of the *Umta*. She is fitted with two single-ended cylindrical boilers 16 ft. diameter, and there is also Howden's forced draught fitted. The fan for the draught is in the engine-room and is driven with an auxiliary engine. There is also in the engine-room a dynamo driven by a separate engine. The feed-heater and evaporator are Weir's. The feed-heater obtains its steam from the intermediate receiver. The reversing gear is Brown's. The steamer takes 8,000 tons of cargo, and is designed to go at 10 knots. On her trial she made 12·4 knots.

Captain Hutchinson and Mr. Newton explained the action of their new derricks, of which there are 10 on board. It will be seen from Fig. 1 that the derrick consists of a wrought-iron rivetted pillar B fixed through the deck. Near the top of this is a quadrant shown in Fig. 2. The quadrant G is supported by two brackets N fixed to the pillar B. On the quadrant there is a traveller E, Fig. 2 and Fig. 3. To this traveller is attached the chain which supports the end of the jib. The lower end of the jib is supported by a bracket in two loops. There is a pulley hanging at the higher end of the jib round which the chain goes. At the lower end it gears into two pulleys, so set that they keep the chain right for the hatch.

Now, the principle of the derrick is this. The traveller E may be fixed at any position of the quadrant by two pins F F, Fig. 4, and wherever it may be fixed the jib is always in its lowest position when its plane is at right angles to the pillar. When it is pulled out of this position it always tends to come back to it. Should, therefore, the worker wish to load he arranges to have the traveller on the quadrant just opposite to the hold. This causes the jib, which has got its load over the side, to go into a position situated above the hold. When the ship is being unloaded, the traveller is placed on the quadrant opposite the ship's side, and so, when the jib has obtained its load above the hold it naturally swings of its own accord to the ship's side.

There is also an arrangement of guys for attaching to the jib and holding it in any position, from rings in the ship's side. The guys go also from side to side of the ship, and on their way pass through a catch which, with the movement of a little lever, holds the guy rope, and therefore the jib, firmly in any position. For our edification a lascar was sent to climb the pillar and put in the pin F at different positions. When the jib was pulled out of its position opposite the two pins it always swung back into that position, when it was let free.

About 100 of these derricks have been fitted on large steamers trading to India and the colonies. Very many engineers and masters have been to see them in work and are astonished at their amazing simplicity.

In consequence of the saving of labour the cost of loading and unloading is greatly reduced.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The Destruction of Cervera's Squadron.

THE Naval event of the month has unquestionably been the destruction of the Spanish cruisers under Admiral Cervera outside Santiago Harbour. The ships destroyed were the four fast armoured cruisers, the *Cristobal Colon*, *Viscaya*, *Oquendo*, and *Maria Teresa*, and the torpedo-boat destroyers, *Pluton* and *Furor*. The *Cristobal Colon* was sold to the Spanish Navy by Italy about two years ago, and was supposed to have a speed of 20 knots. She was protected by a 6 in. belt of Harveyed steel, and her armament was supposed to consist of two 10-in. guns, ten 6-in. quick-firers, and six 4·7-in. guns. But it now turns out that the big guns were not on board this vessel, and Admiral Cervera is reported to have said when asked where they were, "In Italy, or perhaps in the pockets of our chief ordnance officer." Of the other ships the *Viscaya* carried 2 11-in. guns, as did her sister ships the *Oquendo* and *Maria Teresa*. The speed of all three was put down at 20 knots. They were protected by an armoured belt 12 in. thick and by 10½ in. on the barbette. The American fleet, under Admiral Sampson, consisted of the battleships *Iowa*, *Indiana*, *Massachusetts*; the armoured cruisers *New York*, *Brooklyn* and *Texas*; the monitors *Puritan* and *Terror*; the protected cruisers *Cincinnati* and *Detroit*. In addition there were the auxiliary cruisers *Harvard* and *Yale*, and a number of converted vessels, including the *Gloucester*, to the commander of which Admiral Cervera surrendered after his defeat.

Some further Particulars.

There seems to be little doubt that the vessels which attempted to escape from Santiago Harbour were sadly in need of a thorough overhauling. The two destroyers do not appear to have travelled at anything like the speed they are credited with on paper. Even in daylight, with a slight start, one or two of the Spanish ships should have escaped, but they did not appear to have been a match in speed to the American battleships, whose speed is said to have been greatly reduced owing to their bottoms being in such bad condition. The Spanish engineers do not appear to have taken as much care of their ships as did the foreign engineers who were put in charge at first. The British Naval Attaché at Washington is said to have been present at the fight, and he is reported as saying that the Americans had phenomenal luck. The Spanish are said to have admitted that they only hoped to save the *Cristobal Colon*. The 12-in. shell which struck the *Viscaya's* bow torpedo-tube exploded a torpedo in that ship, killing 26 men, and there were 24 holes in her hull. The *Oquendo* had 61 holes in her hull, the *Maria Teresa* 33, and the *Cristobal Colon*, 8. Admiral Cervera has explained that during the time his fleet was in Santiago Harbour the destroyers were never sent out of the harbour to attack the United States' ships, that they were required to keep guard at the mouth of the harbour. One of these vessels, the *Pluton*, appears to have taken an active part in the sinking of the *Merrimac*, for we learn that two torpedoes, one from the cruiser *Reina Mercedes*, and the other from the torpedo-boat destroyer, struck the *Merrimac* amidships, and Mr. Hobson cannot make up his mind whether it was these torpedoes or his own explosives which sank the *Merrimac*. The explosion of the *Viscaya's* bow tube demonstrates the danger there is in continuing to fit ships with exposed tubes, and it is to be expected that the small number of submerged tubes in our warships at present will be greatly increased.

Portsmouth Dockyard.

At this yard work on the various ships, building and refitting, makes good headway. Recently there has been sent out from this yard about five hundred letters to the A.S.E. branches, and other engineering societies in various parts of the kingdom, inviting recruits for the rating of engineer-room artificer. It will be interesting to watch the result of this appeal. Another important item of news is that the Admiralty are considering the advisability of spending one quarter of a million of money on an immense extension of electric plant for the yard. The idea is to abolish the old steam boilers and to substitute electricity for them to drive the machinery. It is proposed that the generating station be upon the site of the old convict prison.

The cruiser *Diadem* was recently commissioned here to take the place of the *Blenheim* in the Channel Squadron, but before joining the fleet she is to undergo a series of commission trials. She will first carry out a 30 hours' preliminary trial at 3,300 I.H.P.; after that a continuous run of 60 hours at the same power, during which time the steam expended in the auxiliary engines will be measured. Her third trial will be 60 hours steaming at 8,250 I.H.P., and her final run will be for the same length of time, when the engines are to develop as large a proportion as practicable of the sea-going full power. The cruiser *Sybil* has arrived here for repairs from Devonport, which yard was unable to undertake the job owing to pressure of work upon the staff. She is to join the Portsmouth Fleet Reserve. The instruction in gunnery and torpedo practice at this port will continue without a break until Christmas, owing to the abandonment of the annual mobilisation. The *Latona* is shortly to be commissioned here for the China or Australian station.

Coaling in the British and Spanish Navies.

During the last week or so some excellent coaling performances have taken place in several ships of the British fleet. In the first place, the battleship *Mars* was ordered to take in 1,200 tons of coal from a collier alongside. It was expected that this work would take at least two days, but, as it subsequently turned out, the whole of the coal was taken aboard in 9¾ hours actual work. All the more credit is due to the ship's company, as there was no competition to stimulate them in their endeavours. Another smart coaling performance took place on the China station, when the battleship *Victorious*, which has recently joined the squadron out there, managed to make an average of 111 tons per hour, against the next best, that of the *Grafton*, the flagship, of 76 tons. The *Victorious* has the youngest ship's company on the station, and it is reported that on the occasion of this coaling contest, officers and men, even the chaplain, gave all the assistance in their power. It must be remembered that the record in the British Navy is considerably over 200 tons an hour. Turning to an account which a correspondent of the *Daily Graphic* gives in a recent number of that paper, we read that the *Pelayo*, Admiral Camara's flagship, when coaling off Port Said, managed to take in 3½ tons per hour. He said that when he arrived on board the battleship the operation of coaling was proceeding, and he continues:—"Being on board a battleship at war, and not at peace manœuvres, I quite expected to see the coal coming 'in ship' like an avalanche, every winch rattling, and hundreds of men, black and grimy, working like fiends. I walked over to the starboard side, where the *Colon* was lying close by, with a broad gangway which bridged the space between the two ships. There was only one winch at work, and seven men on the collier's deck unhooked the baskets of coal as they came up from the hold and pushed them over the bridge in the most leisurely manner imaginable. There were not more than thirty-five men in all engaged, and they were putting in 3½ tons per hour. The decks of the battleship were swarming with seamen, who looked on at their comrades playing with the coal."

A New Battleship for the Navy.

Two most important launches took place early last month. One was that of the battleship *Ocean*, from Devonport dockyard, and the other that of the *Amphitrite* from the yard of Messrs. Vickers, Son & Maxim, Limited, who recently took over the extensive works of the Naval Armaments Construction Co. The *Ocean* is one of the six vessels of the *Canopus* class, which has been so unfavourably contrasted, as regards armour and armament, within the past week or so, with the new American battleship *Alabama*. The *Albion*, recently launched from the Thames Ironworks & Shipbuilding Co., is another vessel of the same class. The *Ocean* is the first modern battleship ever built at Devonport dockyard. Her keel plate was laid as long ago as February 15th, and at the outset her progress was so rapid that it was thought that she would establish a new record in battleship construction. It seemed probable that she would be launched much earlier than her sister ships, the *Canopus* and *Goliath*, and there was a spirited competition between the yards, where the three vessels were under construction, to determine which should be the first to get their ship in the water. The *Ocean* was delayed, however, in the first place for want of skilled workmen in the rivetting and drilling departments, and again because of the difficulty of getting material delivered on account of the dispute in the engineering trade. If the progress which she made in the first month or so had been kept up, she would have been almost ready for the pennant by this time. However, she is in a very advanced state, and has been supplied with most of her internal fittings, bulkhead armour, and a portion of her side armour. Her launching weight, including the cradle, was 7,110 tons. Her dimensions are:—Length between perpendiculars, 390 ft.; extreme breadth, 74 ft.; load draught of water forward, 26 ft.; aft, 26 ft.; load displacement, 13,000 tons; I.H.P. (estimated), 13,000; speed, with full power, per hour, 18 25 knots. The engines, which have been supplied by Messrs. Hawthorne, Leslie & Co., consist of two complete sets of vertical expansion engines, each set being capable of developing 6,725 H.P. The boilers, which are of the Belleville type, are twenty in number. The *Ocean's* armament will include four 12-in. guns, worked in two barbettes; twelve 6-in. guns, worked in casemates; ten quick-firing guns, six Hotchkiss quick-firing guns, four Maxim, and four submerged torpedo tubes. The vessel will carry a total complement of 751 officers and men. The ceremony of naming the vessel was performed by Princess Louise.

Devonport Dockyard.

The most important event of the month in this yard has been the launch of the cruiser *Psyche*, which attracted hundreds of people anxious to see her take the water. She was laid down on November 15th last, and has been exactly eight months building. This is not bad time when it is taken into consideration that hands were constantly taken from her to work on the *Ocean*. The *Implacable* continues to make excellent progress since her keel plate was laid two weeks ago on the slip vacated by the *Ocean*. Close upon 1,000 tons of material is already prepared for her, and it is the intention of those in charge of her to beat all battleship building time if possible. The material has been transferred to the open slip, and it is now officially notified that the vessel has commenced building. The approximate date for her launch is January 3rd next, and it is said that immediately she vacates the slip upon which she is building, it will be utilized for the commencement of another battleship. The cruiser *Rainbow* has been paid off here, and has been placed in the D division of the Fleet Reserve. The cruiser *Edgar* has also been paid off, as well as the battleship *Devastation*. The *Pelorus*, which has just undergone a refit here, underwent a short time ago a successful two hours' trial of her machinery. The cruiser *Furious* has been commissioned by Captain Lewis E. Wintz for service with the Channel Squadron. The new torpedo-boat destroyer *Leven*, which is to be constructed by the Fairfield Shipbuilding Co., Glasgow, will come to this yard for completion. She will displace 308 tons, and her engines are to attain an I.H.P. of 6,000 and are to give her a speed of close upon 33 knots. Fleet Engineer, W. H. Riley, R.N., has been appointed to oversee her construction.

The Launch of the "Amphitrite" and other Cruisers.

Another vessel, which will prove a powerful addition to our Navy, was launched at Barrow early last month. This was the cruiser *Amphitrite*, a sister ship of the *Niobe*. She is one of the *Argonaut* class. Her length is 435 ft. between perpendiculars, and mean load draught 25 ft. 3 in., at which draught the displacement is 11,000 tons. The hull is constructed of Siemens-Martin steel. The double bottom is minutely sub-divided into water-tight compartments. The protection consists of an armoured deck of steel plating, 4 in. thick at the crown, which extends the whole length of the vessel. The coal bunkers have a capacity of over 2,000 tons. The armament is as follows:—16 6-in. quick-firing guns, 12 12-pounder quick-firing guns, 3 3-pounder quick-firing guns, 2 12-pounder boat and field guns, and 8 45-in. Maxim guns. The *Amphitrite* is supplied with two under-water broadside torpedo tubes. There are five steam-steering positions, and hand-gear is also fitted aft under the protective deck. The propelling machinery consists of two sets of vertical direct-acting triple-expansion engines, each set having four cylinders working on separate cranks. The collective I.H.P. is expected to be 18,000 when running at about 120 revolutions per minute with a steam pressure of 250 lbs. The boilers are of the latest Belleville type, fitted with economizers, there being 18 boilers containing eight elements of seven pairs of large tubes and ten pairs of small. The *Amphitrite* will be lighted with electricity throughout. Three other ships were launched at Newcastle-on-Tyne within a day of each other, one a sheathed single screw training ship, the *Jeneral Baquedano*, built by Sir. W. G. Armstrong, Whitworth & Co., for the Chilian Navy, a vessel displacing 2,500 tons, with excellent armament, and a speed of 12 knots with 1,500 I.H.P. open stokeholes. Then there was the launch of a cruiser for the

Japanese Navy. She was named the *Tokiwa*. She is well armed and armoured and has a speed of 21½ knots with forced draught 18,000 I.H.P., 20 knots, open stokeholes 13,000 I.H.P. Another cruiser was launched, which Messrs. Armstrong intend to keep as a stock ship for sale. She was provisionally named the *Fourth of July*. She is practically a replica of the *Takasago*, only differing from that vessel in a few unimportant particulars

Sir William White and His Critics.

At the lunch which followed the launch of the cruiser *Amphitrite* at Barrow, Sir William White made a speech, in which he expressed himself very plainly about what he thought of those who criticised certain classes of ships added to the Navy, statements which, he said, could have no other object than to divert attention and cause sensation. He also took the opportunity of replying to some criticisms which had been passed on the *Powerful*, and asserted that it had been purposely forgotten that the ship had done all that was promised, and had even exceeded that promise. "Whereas," said he, "it was said she must steam for thirty hours at 20 knots, she steamed thirty hours at 21 knots; and whereas it was said that the maximum speed must be 22 knots, she attained nearly 22½ knots. When they heard of 'crawling cruisers,' poor 'crawling cruisers,' going at 20 knots, and that a tortoise speed like that was not to be mentioned with some results one had heard of, I would like to see not a comparison on paper, but a comparison in fact, under similar conditions made between some of the crawling cruisers and ships with which they were not supposed to be mentioned on the same day. I am not in any sense laying claim to infallibility, for I am getting too old for that, yet I do claim that on these matters the British public need not very much consider anonymous and unsupported and partial statements." In the course of his speech he referred in no complimentary terms to the so-called "naval experts," and this has brought down upon him several sharp-toned articles in the press from those who fitted on the cap.

Chatham Dockyard.

The *Irresistible* and *Pioneer*, which are the only two ships building at this yard, continue to make good progress, as also do the *Goliath* and *Vindictive*, which are completing. As regards the *Vindictive*, she is now almost ready for her steam and gunnery trials. Her propelling machinery is finished and her guns and their mountings completed and on board. The construction of the *Pioneer*, which was retarded in order to hasten the refit of the ships of the Channel and Reserve Squadrons, is now being rapidly completed for launching, an event which it is expected will take place early this month. The only thing which hampers the progress of the *Irresistible* is want of material, but as soon as her stem and other missing parts have been delivered she will once again forge ahead. The *Haughty*, torpedo-boat destroyer, is to take the place of the *Janus* in the Instructional Flotilla here. The crew of the *Janus* have been turned over to her. The *Salmon* has also been commissioned to take the place of the *Spitfire*, the latter being damaged, it will be remembered, by a collision wish a barge. The *Dreadnought* has had her old pattern 6-in. guns removed and sent to Elswick, there to be converted into quick-firers. It is also likely that her muzzle loaders will be replaced by 22-ton breech loaders. Some attention has had to be paid to the *Spitfire* torpedo-boat destroyer, which was disabled by a collision with a coal hulk near the Nore, and the *Mallard* also required some attention.

M. Lockroy's Return to the Ministry of Marine.

Included among those gentlemen forming the new French Ministry of Marine is M. Lockroy, who once again fills the office of Minister of Marine. Most of the changes which he introduced during his last tenure of office were swept away by Admiral Besnard, but there is little doubt that he will once more devote himself to the policy he inaugurated during his last term of office. M. Lockroy is flooded with gratuitous advice of all sorts, and if one of the writers in the *Marine Francaise* had his way, M. Lockroy's ministry would be one of experiments. New shells and explosives are to be tried, new commerce destroyers projected, submarine boats to be given a trial, and a great many other things are to be attended to which his predecessor would have nothing to do with. It will doubtless be some time before he can get to work on any of his new ideas, for, according to a French parliamentary paper, France has already sixty-nine vessels in hand—seven battleships, eight armoured cruisers, nine protected cruisers, one despatch vessel, ten torpedo gunboats and one other gunboat, and a transport despatch vessel, with one sea-going torpedo boat and thirty others, and one submarine boat. Then there are, in addition, the vessels provided for under the votes of 1898, one battleship of 12,000 tons, three armoured cruisers, five torpedo-boats, and six first-class boats. The total number of vessels, of which the construction will be commenced, continued, or completed in 1898, is ninety-one, with an aggregate displacement of about 242,476 tons.

An Improved Torpedo.

The new torpedo with which the Japanese intend arming their battleship now building at Elswick would certainly seem to be an improvement upon the one in use in our Navy at the present time. The latest torpedo to be supplied to all the British warships is of the 18 in. pattern, and it is only capable of travelling about 800 yards at the rate of 26 to 28 knots. The Japanese, however, are having 50 torpedoes made for them at Fiume 24 in. in diameter, with a range of 2,000 yards and a speed of 35 knots. They are to be fitted with the gyroscope, and thus a fairly correct aim may be made at a ship more than a mile distant. This is certainly bringing the torpedo into direct competition with the gun, for as yet torpedoes have not been found effective for more than half a mile. The new Japanese torpedo would put the new net defence on our battleships to a severe test, for its abnormal velocity and the force with which it is said to explode is declared to be equal to any net defence yet devised. Fifty tubes for the new torpedo are now being manufactured at Elswick.

Contractors' Penalties.

Apparently the Admiralty have decided to discontinue the policy of imposing penalties when vessels which ought to have been completed within a specified period are not delivered until after that period has elapsed. A question in the House by Mr. Lewis, the member for the Flint boroughs, elicited the reply that penalties amounting to £80,000 were incurred by contractors for shipbuilding, gun mountings, and armaments, in 87 cases, for delaying the fulfilment of contracts during the financial year, which ended in March last. Out of these 87 cases, penalties were enforced in only two of them, and these penalties only amounted altogether to £60. Such a state of affairs would seem to necessitate some investigation, but may be, the Comptroller, who is practically the judge in these matters, decided that the reasons advanced for the delay of the various ships, were quite sufficient to permit of the remitting of the penalty. No doubt much of the delay was due to the engineering dispute. In the course of the discussion, Mr. Allen, of anti-water-tube boiler fame, wanted to know if the builders of the engines of the *Powerful* and *Terrible* had been subjected to penalties, seeing that they had broken down. Mr. McCartney pointed out to him that no penalties had been incurred, because his statement that the engines had broken down was incorrect. According to a contemporary, between February 24th and June 18th, 1894, contracts were given out for six torpedo boat destroyers, for sums amounting altogether to more than a quarter of a million sterling. The period of their construction was from nine to twelve months, but exactly two years after the date when the last of the destroyers should have been delivered not one of them had been finished. The penalties incurred amounted to £86,805, but we are told that not a penny was demanded.

Sheerness Dockyard.

The trials of the *Proserpine* have turned out, up to the present, as successful as could be wished for, although much time was allowed to elapse between the different trials. She came out of her 30 hours coal consumption trial and her 8 hours natural draught trial with flying colours, and she did this also in the case of her 30 hours run. Her machinery has given satisfaction all round and reflected great credit upon Devonport, where the engines and boilers were made. The *Buzzard* is at present undergoing an extensive refit here, and it will be well into September before she is finished, as she had quite a long list of defects after her 10 years absence abroad. The Admiralty have announced their intention of abandoning the proposed erection of the Naval barracks, but in place of these a range of supplementary buildings to the new Naval barracks, which are now being constructed for the Naval depot at Chatham, are to be erected.

Building up the United States Navy.

The Naval Department of the United States has finally decided upon the names of the new battleships, monitors, and torpedo-boat destroyers, which are to be laid down shortly. There are to be three battleships, which are all to be named after various states of the Union, in continuance of the policy of associating the most important warships of the country with the states which make up the Union. Thus, one of the new battleships will be named the *Missouri*, another the *Ohio*, and another the *Maine*, in order to keep in the United States' Navy the name of the ill-fated battleship destroyed in Havana Harbour. The names of the four monitors will be the *Connecticut*, *Wyoming*, *Arkansas*, and *Florida*. Each of these will displace 2,550 tons, and their armament will consist of two 12-in. guns coupled in a turret forward, and protected by an 11-in. plating; also four 4-in. quick-firers. The names of the torpedo-boat destroyers are to commemorate the deeds of past heroes of the United States Navy. For instance, we have *Paul Jones*, *Isaac Hull*, the commander of the frigate *Constitution*, on the occasion of this vessel's historical fight with the *Guerriere*, the *Stephen Decatur*, the *Edward Preble*, the *Lawrence*, the seaman whose name is indelibly connected with the *Chesapeake*, and others. It is also interesting to note that one of the new torpedo-boats will be named after Ensign Bagley, the first United States' naval officer to be killed in the present war.

Russian Naval Matters.

The news is to hand that the Russian Admiralty have decided to postpone the annual evolution of the Black Sea Fleet, which, as a rule, takes place in July. The reason of this is stated to be that the stock of British coal in hand, about 50,000 tons, may be required for certain not improbable emergencies within the current year, and it has therefore been thought advisable not to use it for the manœuvres. What sort of an emergency is likely to arise we are not informed, and maybe this is only a supposed reason for the Russian Admiralty's economizing the British coal in hand. Although the details of Russia's shipbuilding programme have not been given out, it is well known that the programme is a pretty large one, and that some £16,000,000 is to be spent during the period of 1898-1908 on seventy-six vessels of every sort which have been laid down or completed. According to Lord Charles Beresford, who is said to have got his information from a most trustworthy source, these are to be eight battleships, six first-class and ten second-class cruisers, one mining vessel, one torpedo transport, twenty destroyers, and thirty torpedo boats. The Russian Admiralty have decided to organize naphtha tanks at Cronstadt from which the ships of the Baltic Squadron can be supplied. They have also decided that two first-class cruisers and four destroyers shall be put in hand at once at the Nicolieff dockyard, in addition to the many cruisers and torpedo-boat destroyers now in process of construction at the Ilora and other yards. At the end of September, four vessels will be launched from the St. Petersburg yard, namely, the *Osliaba*, and the three first-class cruisers, *Aurora*, *Diana*, *Pallada*.

An Interesting Return.

A most interesting parliamentary return has just been issued, which shows as nearly as possible the percentage of seamen to stokers who, on termination of their first engagement, (*a*) re-engage at once; (*b*) leave, but return within 12 months; (*c*) leave, but return after 12 months; (*d*) leave and do not re-engage. The figures do not go any further than 1895, but the return, at any rate, puts an end to the statements which so often appear, asserting that the proportion of seamen stokers who leave the Navy after their first period of engagement is not far short of 100 per cent. In fact it was stated in Parliament only a week or so ago that very few stokers re-engaged at all, owing to their bad treatment. However, from the parliamentary paper we learn that no less than 83·4 per cent. re-engage at once, while only 6·80 per cent. leave the Navy for good as soon as their first period of service has expired. Figures also show that of the seamen, 65·8 per cent. re-engaged at once, and 22·6 per cent. left and did not re-engage at all. This may be explained by the fact that the strict training which they receive while at sea, enables them to command a much higher wage than they could if they remained in the Navy.

Pembroke Dockyard.

Capt. Burgess Watson's action in making allegations of skulking against the men employed in this yard has been the most talked-of topic of the month here. A short time ago he severely punished three men caught idling, and some assert that the speech which he made upon the matter was evidently intended to explain the severity with which he dealt with them. The men vigorously deny that skulking is indulged in, and that there is any truth in the allegation. Anyway, the yard detective officer now makes a practice of visiting the *Adromeda* nearly every dinner-time in order to find out, if possible, whether the men quit work for their mid-day meal before time. Capt. Watson too, it seems, has discovered several quiet places which were used by labourers for various purposes apparently contrary to regulations, for several of them have now been dismissed. It is expected that the *Adromeda* will go to Portsmouth about the second week of this month, but it is impossible to fix the date of her departure with any certainty. Although the launch of the *Spartiate* is put down for September, this will hardly be possible unless better progress is made with her wood sheathing.

Naval Engineers.

A new scheme of examination has been published by the Admiralty for the information of intending candidates for Engineer Studentships. Their Lordships have decided that in future candidates for entry as Engineer Students are to be examined in the subjects mentioned in the following scheme of examination:

Engineer Students.

OPEN COMPETITION. *LIMITS OF AGE 14½ TO 16½, ON THE 1ST OF MAY OF THE YEAR OF ENTRY.

SCHEME OF EXAMINATION.

CLASS I.

	Marks.
(1.) MATHEMATICS.	
Arithmetic: including vulgar and decimal fractions, rule of three, practice, interest, mensuration ...	400
Algebra: Definitions and elementary processes, factors, fractions, highest common divisor and lowest common multiple, indices, equations up to easy quadratics of two unknowns, and problems arising from them	400
Geometry: Euclid, Books I., II., and III., with easy deductions	400
	1,200
(2.) ENGLISH.	
Handwriting, dictation, reading with intelligence, and composition, to include the writing of a letter on some ordinary subject, and the reproduction of a passage read to candidates	400
(3.) GEOGRAPHY.	
The elements of physical and political geography with special reference to the geography of the British Empire	200
ENGLISH HISTORY.	
The examination in this subject will cover the History of England from the date of the Norman Conquest to present times; but about two-thirds of the marks assigned to the whole subject will be allotted to questions relating to the period subsequent to the accession of Queen Elizabeth ...	200
(4.) FRENCH.	
Translation from French into English, and from English into French prose; grammatical questions, dictation and conversation	400
(5.) NATURAL SCIENCE.	
Mechanics with either (*a*) physics or (*b*) chemistry	600

Mechanics.

Definition and measure of length, time, velocity, acceleration, force, couple, composition of two forces acting at a point, the equilibrium of a body capable of turning about an axis; centre of mass; definition and illustrations of work and energy, and simple examples of the conservation of energy.

Physics.

The characteristics of matter in its various states of solid, liquid, vapour, gas; the methods of determining mass and density, the laws of Boyle and Charles; the effects of heat on bodies, the production of heat; the methods of transference of heat; the measurement of heat and of temperature.

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* The present maximum limit of age (17) to remain in force for the examination in 1899.

Chemistry.

The elements of inorganic chemistry, including the more obvious physical and chemical properties of common minerals, metals, acids and other substances, oxidation and reduction.

CLASS II.

(6.) DRAWING.

(*a*) Freehand and simple rectangular model or (*b*) geometrical 200

ONE OF THE FOLLOWING SUBJECTS.

(7.) ADDITIONAL MATHEMATICS.

Elementary trigonometry, including solution of right angled triangles, and harder questions in arithmetic, algebra, and geometry (Euclid, Books I.-III.) as defined in Class I., with the addition of Book VI., propositions 1-12 400

(8) GERMAN.

Translation from German into English, and from English into German prose; grammatical questions, dictation, and conversation. Marks will be allowed for knowledge of the German written character 400

(9) LATIN.

Translation from Latin into English, and from English into Latin prose; grammatical questions ... 400

Candidates will be expected to take up all the subjects in Class I., and may also take up Drawing and one other subject in Class II.

In order to qualify for entry they must obtain such an aggregate of marks in Class I. as may satisfy the Civil Service Commissioners.

The Supplementary Estimates.

The long-promised supplementary statement regarding the Navy has at last been made by Mr. Goschen. From the statement we gather that an extra £8,000,000 is to be spent upon the Navy during the current financial year for four battleships, four cruisers, and twelve torpedo-boat destroyers, 20 new vessels in all. The First Lord, in his speech before the House of Commons, said that of the four new cruisers, two of them were to be of the *Crecy* class, and the other two to be greater in dimension and superior in speed and armament to that class. Their dimensions are:—Length, 551 ft.; breadth, 71 ft.; mean draught, 26 ft.; displacement, 14,100 tons; speed, 23 knots; H.P., 30,000. They are to have two 9·2 breech guns, sixteen 6-in. quick-firing guns in casements, and fourteen 12-pounder quick-firers. They are to be protected by vertical side armour 6 in. thick, associated with strong steel decks. They are to be subject to 8-hrs. trial at natural draught, and to make a speed of 23 knots; and they are to have water-tube boilers and twin screws. As regards the battleships, Mr. Goschen said that they would not be of the *Formidable* class, but would have rather a higher speed, less draught of water, and be more calculated to pass through the Suez Canal without being lightened. They are to be less armoured, but to be perfectly designed to meet the ships which they are likely to encounter in the waters to which they are sent. The design has not yet been worked out in detail. Russia's expenditure of £16,000,000 upon her Navy, to be spread out over the next five years, is declared to be the main cause of the large sum which Mr. Goschen proposes to expend on our Navy. His statement appears to have given general satisfaction to the public press and "naval experts."

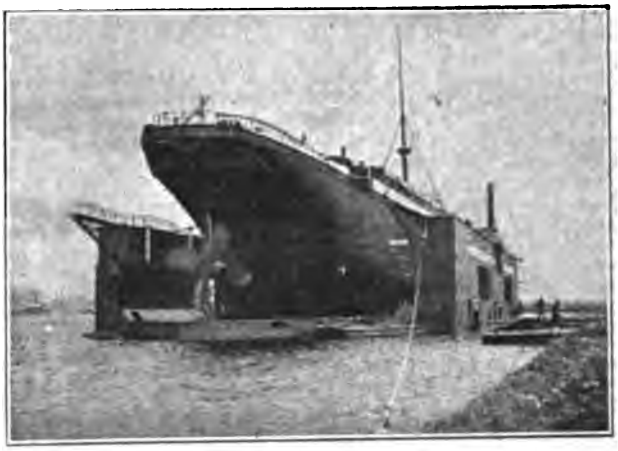
Marine Engineers' Examination.—At the examination held on July 12th, 13th, and 14th the following candidates passed for Extra First-Class Engineers:—Mr J. Carnaghan, jun., Greenock; Mr. G. Ramsay, of Dundee, and Mr. H. J. Firth, of Hull. They were prepared by Mr. W. H. Thorn, 5, Waterville Terrace, North Shields. Fifty-three pupils have passed in the above grade from this establishment.

Institution of Junior Engineers.—The Summer Meeting of the Institution of Junior Engineers, of which Mr. John A. F. Aspinall (L. and Y. Railway) is President, is to be held at Liverpool from August 8th to 13th. The President-elect is Sir William H. White, of the Admiralty.

THE STETTIN PONTOON DOCK.

It will be remembered, no doubt, by our readers, that in our issue of October, 1897, we gave a description and illustration of a floating graving dock which Messrs. Swan & Hunter had built to the order of the Spanish Colonial Office for use in the island of Cuba, at the port of Havana, in accordance with designs which were specially prepared by Messrs. Clark & Standfield of Westminster. This dock was 450 ft. long, 82 ft. wide; the depth over the cill was 27 ft. 6 in., the draught of water being 42 ft. 6 in., and the freeboard 4 ft. 2 in. This dock took seven months to construct.

We have now pleasure in illustrating and fully describing the dock that has just been built by Messrs. Swan & Hunter, to the order of the Stettinei-Maschinenbau-Actien-Gesellschaft "Vulcan," the well-known shipbuilders and engineers, of Stettin, and to the designs of Messrs. Clark & Standfield, of Westminster, and embodies all their latest improvements in their self-docking pontoon docks.



The illustrations comprise a perspective end elevation and a side elevation, a transverse section of the dock, the latter showing the midship section of a ship in the dock; also a view showing the Stettin Dock, lifting her first vessel The Norddeutscher Lloyd's *Spree*, of 6,883 gross register, on July 16th. The dock is 510 ft. in length, the extreme beam moulded is 110 ft. 9 in., the width of the entrance between the rubbing timbers is 82 ft., the draught of water over the cill with 3 ft. keel blocks is 24 ft., and the corresponding depth of water is nearly 39 ft., which allows a freeboard of 4 ft. 9 in., when the dock is fully submerged. The total lifting power of the dock is 11,000 tons.

By reference to the transverse section it will be noted that A are the keel blocks, B the side bilge blocks, C the roller fenders, D the spring timbers, E one of the boilers, F a coal bunker, G a coal-hoist davit, H skylight to stokehold, I the flusher valves with hand wheels, J the pound flusher, K the main drain, W L shows the draught line of dock with a ship on it, L is one of the engines, M the bevil gear, N the vertical shaft from engine to the pump O. P is the flap valve, Q are the hand levers for the

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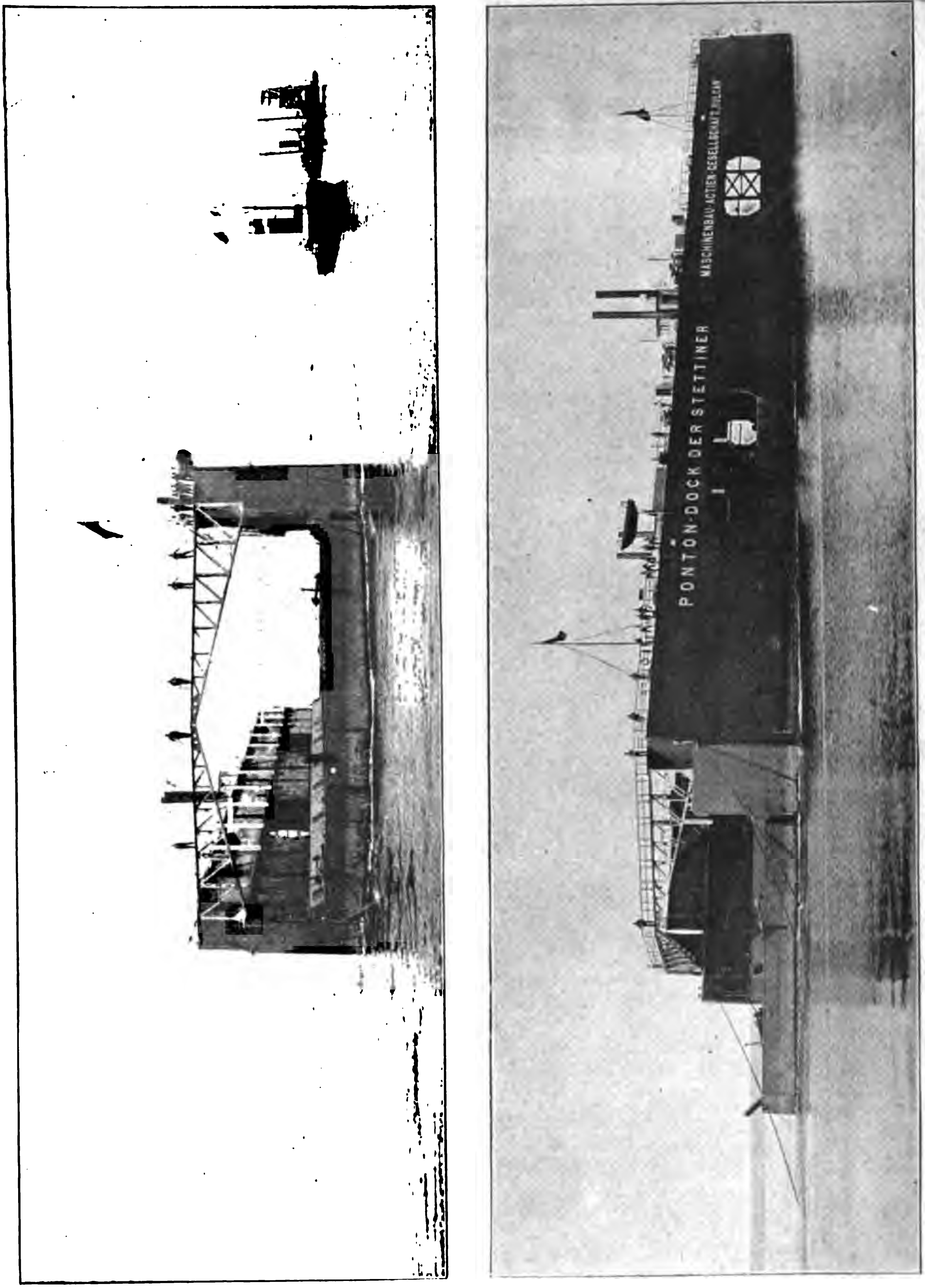
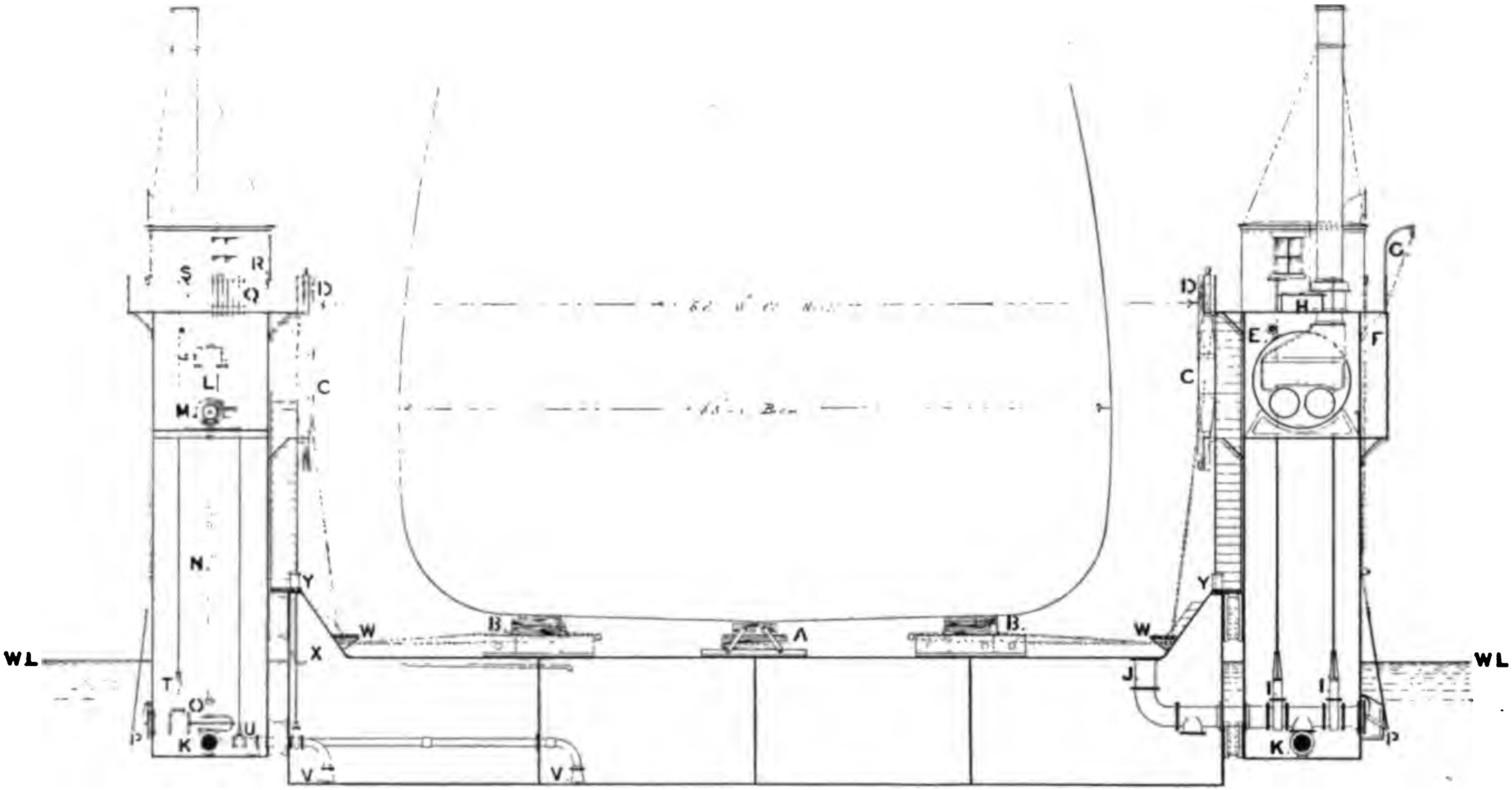

PONTON-DOCK DER STETTINER
MASCHINENBAU-ACTIEN-GESELLSCHAFT VULCAN

THE STETTIN PONTOON DOCK. (PERSPECTIVE END AND SIDE ELEVATIONS.)



THE STETTIN PONTOON DOCK (TRANSVERSE SECTION).

lift valves U, R is the hand lever for the engine stop valve, S is the turning gear for the flap valves P, T designates the discharge valves, U the lift valves, V the bell-mouths to the suctions, W the running deck, X the air pipes, and Y the bollards.

There are two identical installations of power plant, one situated in the port and the other in the starboard tower, and are capable of dealing with the 11,000 tons of ship in 2½ hours. Each installation consists of two boilers of the return tube marine type, 8 ft. 10 in. diameter and 10 ft. 9 in.; the chimneys are led up through the top deck.

One set of engines is provided in each tower, capable of transmitting 125 H.P., they are of the vertical inverted compound quick-running type, and have cylinders 12 in. and 20 in. diameter and 10 in. stroke. The pressure of steam employed is 130 lbs. per square inch. The engines L are directly connected to a horizontal shaft running along the engine deck, which drives by means of bevil wheels M the vertical shafts N running down to the pumps O, which are situated in the bottoms of the towers. Each of the vertical pump shafts is provided with a ball bearing adapted to take the whole weight of the shaft and pump impellers. There are four 15-in. pumps in each wall, each engine driving two pumps.

Steam winches capable of exerting a pull of 3 tons are provided. The bilge blocks B, of wedge pattern, are worked by means of chains from the upper deck of the wall. The dock is provided at each end with a pair of flying gangways or swing bridges, which afford when closed access from one tower to the other. These gangways have been constructed with sufficient strength to be used as cranes, and will be found to be very useful for dealing with propellers, stern posts, or such heavy pieces.

The sub-contractors for the machinery were the Wallsend Slipway and Engineering Co., Limited, who were responsible to the builders for a complete installation of machinery suitable for working the dock. The engines and pumps were manufactured by Messrs. Gwynne & Co., of Holborn; the valves by Messrs. Blakeborough, of Brighouse; and the boilers by Messrs. Riley Bros., of Stockton.

In connection with the reference to the Havana Dock in the commencement of this article, it is interesting to note that the contract for the Stettin Dock was signed on Oct. 23rd, 1897; the first plates for same were delivered on Nov. 1st and laid on Nov. 13th. It was launched on May 21st, 1898, and left the Tyne on June 9th, arriving at Stettin on June 18th, and went through the official trials on June 21st.

It was towed over by the tugs *Roode Zee* and *Zwarte Zee*, with the *Noord Zee* in attendance, belonging to Messrs. Smit, of Ablasserdam, Holland. On Sunday, June 12th, bad weather was experienced, with heavy seas on the port bow, which rendered the progress very slow. However, we understand, the dock behaved exceedingly well, and was entirely uninjured, though the seas broke repeatedly over the pontoon deck.

As will be seen from the illustrations the dock was towed by double bridles, one to each tug, which were made fast to shackles and bollards situated on the lower ends of the walls, and to the bight of which the hemp towing-hawsers were attached.

THE MARINE ENGINEERS.

MR. BERRY, who was formerly of the Board of Trade, and left to become superintendent engineer of the Lund Line (London) has been appointed superintendent engineer of Holt's Line of steamers which mainly go to China.

Mr. Shanks, of the Board of Trade, has been appointed superintendent engineer of the Lund Line of steamers in place of Mr. Berry.

Mr. Manuel, superintendent engineer of the P. & O. Line, who went to Egypt for his health, and while there, paid a visit to see the *China*, has returned to duty, restored to health.

The British India Co.'s steamer *Jelunga*, transport 10, sailed from Southampton on the 14th inst. at daybreak for the Mediterranean with the Guards. Mr. Stevenson is the chief engineer. She is due back on 20th August, and proceeds again on the 27th August with troops to the Mediterranean.

The new steamship *Ula* (Denny & Co., builders), of the same company, sailed for Bombay on Wednesday, July 13th. Mr. John Riddell is the chief engineer.

The *Nubia* P. & O. has sailed for Egypt with troops.

The British India Co.'s steamer *Umta* (A. Stephen & Son, builders), came round from the Clyde *via* Middlesbrough, completed loading in the Royal Albert Dock, and sailed for Calcutta on the 22nd. The chief engineer is Mr. Jas. Paterson.

The British India Co.'s steamers *Dunera* (chief engineer, Mr. Turnbull), and *Dilwara* (chief engineer, P. Boyd), have both been chartered for transport service for next ensuing season, Bombay and Southampton, also the *Simla* (John Reed, chief engineer), and *Nubia* (R. Mollison, chief engineer) belonging to the P. & O. Co.

The report of the Merchant Seaman's Orphan Asylum for 1897 has been placed in our hands. As everyone knows, this valuable institution is at Snaresbrook, Essex, and is under the patronage of the Queen. We are informed that the anniversary festival was held on the 20th April last, and resulted in the addition of £4,000 to the funds of the institution. Mr. T. L. Devitt, of the Shipping Federation, was chairman, and his personal exertions greatly contributed to bring about this success. Twelve girls and twelve boys were elected in March last from a list of twenty-nine candidates; and in September five girls and five boys from a list of thirty-one. The subjects of instruction in the boys' school were: Scripture, reading, composition, dictation, grammar, arithmetic, geography, history, and drawing; with shorthand, domestic economy, practical music, and typewriting in the senior division. In the girl's school: Scripture, reading, composition, dictation, grammar, arithmetic, geography, history, and drawing together with shorthand, domestic economy, practical music, and typewriting in the senior division. The rules of admission are that no child can be admitted under the age of seven years or above the age of eleven years, and no child shall be dismissed until they reach the age of fourteen years and a-half nor continue after the age of fifteen years. Subscribers of five guineas at one time, or to that amount in one year, are life governors entitled to a vote at the general meetings, and for every additional sum of five guineas shall be entitled to an additional vote. Subscribers of half-a-guinea annually shall be entitled to one vote at all elections. Every owner or master of a ship collecting from the crew to the amount of half-a-guinea annually shall be entitled to a vote at the elections. Any person can put an orphan on the foundation irrespective of election, by paying into the funds of the institution in one sum.

7	years and	under	8	£100
8	,,	,,	9	90
9	,,	,,	10	80
10	,,	,,	11	70
11	and	over	.. .. ..	60

The elections are in March and September. There have been admitted into the institution since its foundation; the children of engineers 156, boilermakers 6; and there are resident at the present time; children of engineers 41 and of boilermakers 3.

Mr. R. D. Keay's paper The Thermodynamics of the Steam Engine, and the report of the full discussion on the same, has been distributed to members of the Institution of Marine Engineers. The paper is a very valuable one; the article considers the mechanical equivalent of heat; latent heat, the effects of jacketing and superheating, specific heat of steam, the Carnot cycle.

MAGNOLIA METAL.

THE Magnolia Metal Co., the Magnolia Anti-friction Metal Co., and the Magnolia Anti-friction Metal Co. of Great Britain, Limited, have brought an action against the Tandem Smelting Syndicate, Limited, which has just been heard, to restrain the latter from passing off anti-friction metal not of the plaintiffs' manufacture, as plaintiffs' metal by use of the name Magnolia, and from advertising themselves as manufacturers of Magnolia Metal, and from representing that the metal manufactured by them was Magnolia Metal, and that their "Tandem C." Metal was the same as Magnolia Metal. Defendants counterclaimed for libel.

Mr. Bousfield, Q.C., and Mr. R. Newton Crane were for the plaintiffs; Mr. McCall, Q.C., and Mr. T. F. Hobson were for the defendants.

After the arguments by the learned counsel and evidence by expert witnesses, Mr. Justice Ridley, in summing up to the jury, said that there were three questions for them:—(1) Did the word Magnolia indicate the manufacture of the plaintiffs? (2) Was the defendants' metal practically and commercially the same as the plaintiffs'? (3) Did the defendants use the word Magnolia so as to pass off their metal as the plaintiffs' manufacture?

In answer to these questions, the jury agreed that up to the trial of the action before Mr., now Lord, Justice Collins, brought by the present plaintiffs against the Atlas Metal Co., that is to say up to November, 1896, Magnolia did mean the manufacture of the plaintiffs, but they could not agree as to the period of time subsequent to that date. To the second question the jury answered No. To the third question they said that the defendants did not pass off their goods as the same as the plaintiffs', but that they did represent them as similar.

Mr. Justice Ridley, in delivering judgment, said that there was some difficulty from the curious form in which the jury had answered the first question. He was of opinion that the word Magnolia continued to mean the manufacture of the plaintiffs after the trial in November, 1896. He did not see why the jury thought that that trial made any difference. But there was no finding as to whether Magnolia continued to have that meaning after that date. Therefore, he did not see how the plaintiffs made out a right to an injunction preventing the use of the word Magnolia, though he could see why they attached importance to the use of the name, and he thought that the case of the defendants on that head was devoid of merit. Whatever might be the proper deduction to make from the first finding, the word Magnolia could not be used in such a way as to pass off the goods as those of the original maker. Upon the whole, he thought that he ought to grant an injunction restraining the defendants from advertising themselves as manufacturers of Magnolia metal, and from representing that the metal manufactured by them is Magnolia metal without distinguishing clearly their metal from the plaintiffs' metal, and an injunction restraining the defendants from representing that their Tandem C. Metal is the same as Magnolia metal. He would not, however, grant an injunction in the terms of their finding. There would be an inquiry as to damages, and judgment for the plaintiffs on the counter-claim.

ELECTRICAL NOTES.

(From our own Correspondent.)

THE question of the distance of discovery of torpedo-boats is of interest to marine engineers. Lieutenant Smith, of the United States Torpedo Station, has been making some trials with the searchlight and torpedo-boats, and finds that the average range of discovery was between 781 yards and 2,000 yards when there was no fog or mist, and generally during the trials there was full moon. The torpedo range being 500 yards, the torpedo-boat would require to cross a zone of 281 yards to come within range. At 20 knots an hour this would require 25 seconds, and the ships' guns would require to strike it in that time to keep itself safe. If several torpedo-boats were to attack the ship at the same time there would appear very little chance for the ship.

The battleship *Alabama*, launched recently at Cramp & Co.'s shipyard, has been very fully equipped electrically. There is a total installation of 770 incandescent lamps, and four searchlights have been provided with parabolic or Mangin mirrors. Two sets of night signalling apparatus, with spare lanterns such as are in use in the U.S. navy, two diving lamps, four portable electric ventilating sets, and 12 1-12th H.P. electric disc or ceiling fans. Altogether there are 789 lamps, with a capacity of about 623 ampères. There are 32 circuits, with 20 feeders, divided up into sections. There are 65 battle lanterns, over 130 bulkhead and 49 bunker lamps, four cargo reflectors, 35 magazine lanterns, lights for the engine-room telegraphs, helm telegraphs, and indicators for the binnacles.

The trial of an electric launch built by the Vril Launch Co. took place last Monday at Portsmouth. The launch, which is 32 ft. in length, 8 ft. beam:, and depth 3 ft. 8 in., is for Captain J. Grigorovitch, on behalf of the Russian Government. All the fittings are of gunmetal, nickel plated; cushions covered by morocco. It is a sea-going boat, to be used on the Russian lakes. The machinery consists of a 7,000-watt motor, wheel controller, and 42 E.P.S. Faure King accumulators. The cells are placed under the seats. The machinery gives a speed of about seven knots for four hours. The motors have no external field. The field magnets are of cast steel, and series wound in two equal circuits. The armature is wound in two distinct circuits, and has a commutator at each end. The brush gear is of delta metal, and carbon brushes are used. The controllers have absolutely instantaneous make and break. In working the launch the first movement of the controller to half speed, either ahead or astern, puts the full battery into the motor, which is connected up so as to form practically two motors in series, one field winding and armature winding in series being in series with the other field and armature in series. The next movement to full speed connects the motor up as two in parallel—one field and armature in series in parallel with the other field and armature in series. The tail shafts are made of hand-rolled brass, and the stern tubes lined with lignum vitæ. On the trial the ammeter showed 40 ampères at half speed and 120 at full speed, and voltmeter 72 volts. The H.P. at full speed is nearly 11·5.

Electric cranes have been for some time used on the Norddeutscher Lloyd's steamers. Their lift is 17 ft. They are in two sizes, 3 and 1½ tons. On some of the vessels there are as many as 16 cranes worked by two dynamos. They give 90 K.W. The lift work consists of a simple worm-and-wheel gear fixed to a 25 H.P. motor at 700 revolutions. At 105 volts there are 210 turns. The turning motor has a double worm and wheel, and a cogwheel transmission without self-acting stop. A hand brake is fixed upon an elongation of the motor axle, and a slight pressure on the footplate of the brake stops at once a load descending at full speed. Two medium controllers serve to start, regulate, and turn the motors, and behind these are two resistances of 32 H.P. capacity. The following figures are given by the *Zeitschrift für Elektrotechnik*:

Load.	3 tons.	1½ ton.
Speed when loaded ……	·32 yds ……	.63 yds.
Speed when empty ……	·6 yds ……	1·1 yds.
Lift motor ………………	25 H P. 900 rev.	25 H.P. 900 rev

Useful effect of the cranes, inclusive of motor, 25 per cent.

DOCKING FACILITIES AT BLYTH.

ON June 27th the Blyth Dry Dock Co., Limited, successfully docked the *Clan Macfarlane*, built to the order of Messrs. Cayser, Irvine, & Co., of Glasgow, by Messrs. W. Doxford & Sons, Limited, Sunderland. The vessel is the largest docked at Blyth, her principal dimensions being:—Length between perpendiculars, 400 ft.; breadth, moulded, 50 ft.; depth, 30 ft. 6 in.; depth to turret deck, 38 ft. Her nett register is 3,107 tons, and the gross tonnage is 4,823.

After her trial trip, which was in every respect satisfactory, the vessel, in command of Captain McMahon, entered Blyth Harbour at six o'clock in the evening, and within twenty minutes from the time of her arrival the gates of the most recent and improved of the graving docks on the north-east coast had closed, and the vessel was in position over the keel blocks. In order to facilitate the cleaning of the side of the vessel, preparatory to their receiving two coats of red and white lead, and two coats of anti-fouling composition, the centrifugal pumps, by which it is possible to empty the dock within an hour, were used at only quarter pressure, and at nine o'clock the same night—three hours after the vessel had entered the harbour—the new turret boat was on the keel blocks in position for the painters. The performance is one of the smartest in the way of dry-docking which has been accomplished on the north-east coast. The dock is one of the largest on the north-east coast, its length being 480 ft.; width at cope, 89 ft.; width at entrance, 61 ft., depth of water on sill at high water, 22½ ft.; and the depth from cope to floor, 31 ft. 3 in. The dock walls and floors are composed entirely of Portland cement concrete. The engine-room is below the surface level, and is 42 ft. long by 33 ft. 6 in. wide by 23 ft. deep, and is situated between the old and the new docks; the walls and floors are also built of cement concrete. The pumps are composed of two independent compound tandem engines, having cylinders 15 in. and 27 in. diameter respectively by 20 in. stroke, and the pumps are of Gwynne's Patent M. 36 in. size, each having suction and discharge pipes 36 in. diameter and pump discs 6 ft. diameter, capable together of delivering 56,000 gallons of water per minute against a head of 30 ft. There is also one 10-in. centrifugal pump for drainage. Steam is supplied by two marine multitubular boilers working at 100 lbs. pressure. The gates are built entirely of steel with Greenheart Mitre posts; quoins and sill pieces are hung from the sides and are held by strong anchor bolts built into the entrance walls.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from June 25th to July 23rd, 1898:—

Allen, Joseph W., fleet engineer to the *Tamar*, for charge of the *Wivern*, and for general duties in Reserve, to date July 22nd.
Attwood, H. M. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Bartlett, E. C. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Begg, W. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Bell, J. F. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Black, D. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Bolton, A. W., engineer to the *Vivid*, supernumerary, to date July 19th.
Boyle, J. C. M. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Brown, W. J., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's fleet.
Callaway, R. G., fleet engineer, has been placed on the Retired List, with permission to assume the rank of inspector of machinery.
Carlisle, Archibald H., assistant engineer to the *Ramillies*, to date July 21st.
Chapman, William P., chief engineer to the *Victory*, for the *Sybille*, to date July 12th.
Cock, Alfred E. (probationary), assistant engineer to the *Howe*, for service during summer cruise. to date July 1st.
Cocks, Frederick A., fleet engineer to the *Blake*, to date June 28th.
Coleman, Arthur W. (probationary), assistant engineer to the *Collingwood*, for service during summer cruise, to date July 5th.
Coomber, T. G. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Croisdale, Louis R., assistant engineer to the *Royal Sovereign*, to date June 30th.
Crowley, Edward A. E., chief engineer to the *Vivid*, for the *Retribution*, to date July 18th.
Davies, R. B. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Denny, John T. H., fleet engineer to the *Victory*, for the *Orlando*, to date July 19th.
Downer, J. M., chief engineer, has been advanced to the rank of staff engineer in her Majesty's fleet.
Edgar E. J., acting chief engineer, has been confirmed in the rank of chief engineer in her Majesty's fleet.
Edmunds, P. L. (probationary), assistant engineer to the *Victory*, supernumary, to date July 1st.
Eldred, Charles E., engineer to the *Colossus*, for the *Renard*, to date July 10th.
Ellis, Matthew W., fleet engineer to the *Defiance*, for torpedo store, to date July 18th.
Evans, A. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Ewart, Arthur E. (probationary), assistant engineer to the *Melampus*.
Fincham, W. C., fleet engineer to the *Victory*, for the *Inflexible*, to date July 19th.
Fisher, F. C. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Fraser, George J., fleet engineer to the *Victory*, for the *Reserve*, to date July 19th.
Freeman, B. F. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Gibson-Sugars, John Sugars, chief engineer to the *Wildfire*, additional, for the *Desperate*, reappointed on promotion, to date May 1st.
Grant, Henry W. (probationary) assistant engineer to the *Alexandra*, to date July 5th.
Greene, C. G. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Hamblin, F. W. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Hall, Arthur C. (probationary), assistant engineer to the *Alexandra*, to date July 5th.
Hare, John S., assistant engineer to the *Colossus*.
Harrison, J. H. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Head, E. A. W., engineer to the *Victory*, for the *Wizard*, to date July 19th.
Hearn, J. H. C. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Hobbs, Lionel M. (probationary), assistant engineer to the *Australia*, to date July 5th.
Hughes, J. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Hyne, Arthur E., assistant engineer to the *Severn*.
Jeffery, R. G. (probationary) assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Johnson, C. H. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Kirwin, J. J., assistant engineer to the *Galatea*.
Lashmore, Harry, engineer to the *President*, additional, as assistant to inspector of coal for South Wales, to date July 8th.
Lawrance, William W., engineer to the *Victory*, additional, to date July 21st.
Lawton, W. R., engineer to the *Victory*, for the *Europa*, to date July 19th.
Leighton, James, fleet engineer to the *Victory*, additional for the *Sultan*, to date June 28th.
Lemon, John A., inspector of machinery to the *Terror*, as chief engineer at Bermuda Yard, to date July 15th.
Lilburn, T. E. F. (probationary), assistant engineer to the *Vivid* supernumerary, to date July 1st.
Longland, W. C. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Lumsden, W. G. G. P. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Main, C. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Martell, Percy D., engineer to the *Victory*, for the *Fawn*, to date July 2nd.
Martin, G. R. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
May, F. F. (probationary), assistant engineer to the *Victory* supernumerary, to date July 1st.
McGregor, William, engineer to the *Victory*, additional, to date July 22nd.
McKinlay, A. W. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.

OBITUARY.

MR. DUNCAN McGREGOR.

To a considerable section of our readers intimation of the death of Mr. Duncan McGregor, nautical instrument maker, Glasgow, will be received with regret. The melancholy event occurred on the 7th ult. at his residence in the Pollokshields district of Glasgow. The business with which Mr. McGregor was associated was formed by his grandfather in Greenock almost a century ago, and on the demise of that relative, about thirty years ago, he, in conjunction with a Mr. Walker, took over the business, which was afterwards extended to Glasgow and Liverpool, and is now one of the most important of its kind in the country. It will be carried on by deceased's two sons, D. & R. McGregor. On yachting matters Mr. McGregor was a great authority. He was official timekeeper for all the Clyde clubs for almost thirty years, and also for the Mersey Club and the Royal Highland Club at Oban. For fully twenty-five years Mr. McGregor has attended nearly every regatta that has been held on the Clyde, and his genial personality made him one of the most popular men amongst yachtsmen. The duties of official timekeeper will now rest with deceased's youngest son.

MR. G. W. BROWN.

It is with extreme and sincere regret that we have to record the death of Mr. George W. Brown, a member of the firm of Messrs. Hoar & Brown, who was an old friend of ours, and an advertiser in the journal. A few weeks back Mr. Brown had a serious bicycle accident, in consequence of which he had to undergo an operation on account of serious internal injuries. Unfortunately soon after, his wife, who had been suffering from diabetes, suddenly died. This fact could not be kept from him, and the shock was so great that he succumbed. He was 50 years of age, and his wife was 41. They leave an only son, 19 years of age. It was with the firm of Peter Rolt & Co. that the late Mr. Brown commenced his business career. He was engaged from his youth in the mahogany and teak department at the West India Docks, where his large and varied experience was gained. He was subsequently appointed manager, a post which he filled with great satisfaction to the firm for many years. After a short time with Messrs. Bulmer Bros. & Co., to whom he next went, he decided to start in business in partnership with Mr. Percy Hoar, since which time their business has pursued a course of uninterrupted success.

Apart from his business life, the late Mr. Brown occupied himself in local affairs in Erith, where he lived. He was a J.P. of Kent, and chairman of the Urban District Council for Erith. His chief hobby was yachting, which he followed with much zest.

The extremely sad circumstance of his last illness, brought about by a terrible accident, and the sudden death of his wife while he was lying in such a critical condition, as well as the well-deserved popularity which he enjoyed among the trade, has awakened feelings of unusual sympathy for the members of his family and his partner, with which we desire to be associated.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

THE latter half of June, and the month of July—so far as it has gone—have been characterised by great activity in launching new tonnage from Clyde stocks, but from the 14th to the 25th a complete cessation of operations has taken place, the occasion being the Annual Fair Holidays. This year the stoppage has been quite as universal as in previous years, and no doubt the respite from their labours has been quite as well, if not better, earned than ever before, by the Clydeside artisans. The approach of the holiday period has always the effect of stimulating effort to accomplish as much as possible prior to the stoppage, and to this circumstance must be attributed the rush of launches above spoken of. It has also helped to the remarkable output for the month of June, as well as the unprecedented output for the first six months of the year.

During the six months there were launched from Clyde stocks, or taken down and shipped in pieces for re-erection abroad—a class of work of which there is almost always a considerable amount going forward on the Clyde—new tonnage aggregating over 210,000 tons gross measurement. This is by far the biggest half year's work ever accomplished in the history of the industry. During June alone the output reached 50,000 tons, which is higher than that of any previous June, or, in fact, of any other single month's output ever recorded. These results form eloquent testimony to the will with which employed and employers alike set themselves the task of wiping off the heavy arrears caused by the prolonged eight-hours' war.

There is still a great amount of work on hand, but shipbuilders' prices having stiffened—through advances in material and prospective advances in wages—there has been a falling off in new contracts. During June, only some 17,000 tons were booked; a considerable falling off from the 30,000 and 40,000 tons of some months earlier in the year; while during what has passed of July the cessation of new orders has been still more marked.

Of work still on hand, or to begin to, however, there is enough and to spare, and in this connection it is pleasing to note that employers and workmen are amicably arranging their differences, not only on the question of wages, but in regard to wilful loss of time by some sections of the men. As a result of a conference held in Glasgow on the 28th June, between the representatives of the Boilermakers' and Iron Shipbuilders' Societies, and the Engineering and Shipbuilding Employers' Federation, an advance of 5 per cent. on piecework rates, and 2s. per week on time rates was arranged, but largely on the understanding that Mr. Knight and his executive would give the employers every assistance in dealing drastically with the "broken time" annoyance. In his report for July to the members of the society, issued subsequently by Mr. Knight, he makes it abundantly evident that he is anxious to implement the undertaking as to lost time; but whether his remarks, condemnatory of the failings of the men in this respect, are calculated to do much towards an amelioration of the evil, is, to say the least, doubtful.

The Fairfield Shipbuilding & Engineering Co., Govan, are making preparations for laying down two first-class armoured cruisers to be named *Cressy* and *Aboukir*. These vessels will be 440 ft. in length with a displacement of 12,000 tons. Their machinery will be of 21,000 H.P., for a speed of 21 knots. These vessels are the first in the British Navy to be fitted with Krupp steel side armour, the thickness being 6 in. The guns are to be specially protected with thick-armoured casemates, which will be supplied by Messrs. William Beardmore & Co., Parkhead Forge.

The several shipbuilding firms on the Clyde who undertake Government contracts, have still a goodly amount of important work on hand, and are being asked to tender for additional cruisers of the first and second class. It is confidently expected that a share of the work to be given out will find its way to the Clyde district.

Messrs. Scott & Co., engineers and shipbuilders, Greenock, who have at present four large steamers under construction for the Ocean Steamship Co., of Liverpool, have contracted to build and engine for the same Company other four steamers, each of about 8,000 tons deadweight capacity.

New shipping to Russian account has formed no inconsiderable part of the shipbuilding work accomplished within recent years on the Clyde and elsewhere, the number and great capacity of light draught steamers and barges being especially a feature. This may be regarded as testifying to the enterprise and vigour with which the work of development, both in railway construction and in canal and river navigation, is being instituted, and carried on throughout the Russian Empire. A further necessary branch of this work consists in the deepening and improvement of harbours and waterways, and for the means to adequately accomplish this, the Russians have largely patronised home firms of late. An instance of this is the launching complete in the first week of July by Messrs. W. Simons & Co., Limited, Renfrew, of the *Fedor Enrold*, being the third of four powerful barge-loading dredgers which that firm have on order for the Government of Russia. In all these vessels, independent steam hoisting gear is provided for manipulating the bucket-ladder, and also independent steam-winches are fitted at the bow and stern of the vessels for manœuvring when at work. Electric light is fitted on deck and throughout the vessel for working day and night.

The Steel Co. of Scotland shipped to Portsmouth early in the month the cast steel ram stem for the first-class battleship *Formidable*, at present under construction in the dockyard there. The stem, which is somewhat different in design to that adopted in previous British battleships, is all in one piece, and weighs upwards of 36 tons.

Messrs. Wm. Beardmore & Co., Parkhead Forge and Steel Works, Glasgow, have received an order from the Admiralty for £40,000 worth of specially hardened 6-inch nickel-steel plating for use in the construction of the first-class battleship *Implacable* now being laid down in Devonport dockyard on the berth recently vacated by the *Ocean*. This means about one-fourth of the total quantity of armour plate required for the vessel.

The Admiralty, it may be noted, are in the market for very large quantities of steel. One Glasgow firm recently quoted for about 6,000 tons, and have been invited to tender for 12,000 to 15,000 tons of plates, which will be placed very shortly. The same firm has received contracts from the Admiralty for a large quantity of boiler plates, and have considerable work on hand for the Turkish Navy.

Operations connected with the erection of the new tube works, referred to in last month's Notes as being about to be started at Coatbridge, have just been commenced. The premises are being laid down on a site leased from Messrs. William Dixon & Co., Limited, of Calder Ironworks, lying directly north of the Airdrie branch of the Caledonian Railway. The feu extends to fully 20 acres, and is admirably adapted for the purpose for which it is taken. It is close to the two competitive systems of the Caledonian and North British Railways. The new company starting the works, to be known as the Clydeside Tube Co., includes two gentlemen, Messrs. Brown and Wotherspoon, who are well-known in the commercial world, have large experience in the tube trade, and have for many years been closely identified with the firm of A. J. Stewart & Clydesdale, Limited, which was some time ago merged with Menzies & Co., tube makers, and is now known as A. J. Stewart & Menzies, Limited. The Clydeside Tube Co. intend to make a speciality in solid drawn tubes, such as are now so largely in request for water-tube boiler manufacture, as well as the higher class of welded tubes. The works will give employment to a large number of workmen.

During the month a statement was current, and excited a good deal of comment in shipbuilding circles, to the effect that in consequence of a dispute with Sunderland Corporation with regard to roads through their works, Messrs. Doxford & Sons were threatening to remove their shipyard and engine works from the Wear to the Clyde. Some works for sale on the Clyde had been offered to them. Should this transference be brought about, it would doubtless give a decided fillip to shipbuilding on the Clyde. The firm ranks as the second largest employers of labour on the Wear, their output in the first half of the present year having reached 16,000 tons. The only yard available on the Clyde at present is that of Messrs. Napier, Shanks & Bell, at Yoker, which is in the market at the price of £30,000.

Another instance of Clyde skill and training being requisitioned by North-east coast engineering concerns is that of the appointment which has recently been made to the managership of the Central Marine Engine Works, West Hartlepool, rendered vacant by the lamented decease of Mr. Thomas Mudd. The gentleman who has been selected to succeed him is Mr. W. Cameron Borrowman, Wh.Sch., A.M.Inst.C.E., who is at present assistant manager of the engine works of Messrs. Barclay, Curle & Co., Finneston, Glasgow. Previous to undertaking that appointment Mr. Borrowman was for ten years with Messrs. Robert Napier & Sons, at Lancefield Works, Glasgow. At the outset of his career he won one of the Whitworth scholarships—the fourth in the kingdom—and many medals and other scholarships. He also obtained a diploma of the University of Glasgow for mechanical engineering, and for a short time was chief assistant to Professor Jamieson, of the Glasgow Technical College, and aided that gentleman in the preparation of some of his text-books for publication. For a considerable period Mr. Borrowman was president of the graduate section of the Institution of Engineers and Shipbuilders in Scotland.

The decision of the House of Commons Committee on the Renfrew Burgh and Harbour Extension Bill, which was given on the 6th ult., to the effect that so much of the preamble as related to the harbour extension, and also so much as related to the burgh extension in respect of the harbour and subsidiary matters was concerned, was proved, came as a surprise to many Clydeside people, especially to the members of the Clyde Navigation Trust, whose interests will be seriously affected in the event of the Bill becoming law. It was unanimously decided by the management of the Trust to renew the fight against the Bill in the House of Lords Committee, and this came before it on the 18th inst. Nothing apparently is being left undone to secure a reversal of the decision come to by the Committee of the Lower House. Probably, however, the Renfrew authorities may again be able to convince another disinterested committee of gentlemen that there is need for a large shipping dock at that point on the river. Whatever the result may be, it may be taken as pretty certain that Clyde shippers will, ere long, be provided with additional dock accommodation, and likewise with extra facilities for loading and unloading of coal and ore cargoes. If the Renfrew Town Council are not permitted to take the initiative in that direction, the Clyde Trustees will themselves see to it; available space existing for the purpose at Shieldhall, below Govan. (While revising proofs of these Notes, a decision on the evidence given before the Committee of the Lords has been arrived at. Much to the disappointment of the Renfrew promoters, and, of course, to the jubilation of the Clyde Trust and other objectors, that decision is against the bill.)

On the question of Welsh coal versus Scotch for use on board naval ships, every possible means is apparently being taken to secure for the latter at least a thorough trial. Questions have been put in the House of Commons on the subject by Scottish members; and replying to one of these two weeks ago, Mr. Macartney said that the Admiralty were fully aware of the merits and demerits of Scotch coal, but should there be any such which had not been tested on its merits, an opportunity for doing so would be afforded, and that Scotch owners would be allowed to tender. If this thing can be carried through, it will be of undoubted advantage to Scotch coal owners. The advantage Welsh coal has is that it gives less smoke; but Scotch coal on the other hand does not explode in bunkers. There can be no doubt that there is in Slamannan, Kilsyth, and Fifeshire coal quite capable of serving the Admiralty's purposes in ordinary naval manœuvres. If it is capable of driving the Atlantic greyhounds which sail from Glasgow, it is surely able to drive ships in naval manœuvres. This, at all events, is being put to the proof as these Notes are being penned, as the vessels of the Channel Squadron now in Scottish waters are to be replenished with Scotch coal in place of, as formerly, carrying an extra supply of the favoured article.

Shipbuilding, engineering, and cognate industries at Leith continue in a healthy state, ship-repairing, of course, forming no inconsiderable part of the activity going on. Messrs. Menzies & Co., Limited, are, as usual, well employed, and as regards their engineering department, are finding that the recent large extensions made to the premises, and the splendid new machine tools laid down, are no more than commensurate with the demands made upon them.

Messrs. Hawthorn & Co., Limited, engineers and shipbuilders, Leith, have received an order from the Commissioners of Northern Lighthouses for the construction of a powerful twin-screw vessel for service on the East Coast of Scotland. She will be fitted with all the latest appliances, including the necessary apparatus for carrying large quantities of gas under high pressure, for the purpose of charging the gas-lit buoys. The firm have also received an order from Mr. Thomas Devlin, of Newhaven, for a powerful screw steam trawler, to be fitted with triple expansion engines.

During the month Messrs. Ramage and Ferguson had a satisfactory trial of the *Cathay*, a steel screw steamer of 6,000 tons deadweight capability—the largest ever turned out at the port—and had her taken over by her owners, the Asiatic Steamship Co. of Copenhagen. The new vessel is for that company's trade between the Baltic and Continental ports with Siam in China and the Far East. For the Galloway Steam Packet Co., of Leith, who have recently disposed of—to the Turkish Government at a good price—two of the finest of their fleet of smart little paddle steamers, with which they carry on their passenger and tourist service on the Firth of Forth, specifications are being prepared, and Leith builders, it is expected, will shortly be commissioned to build one, or perhaps two, first-class vessels to replace them.

The Leith Dock Commission are having ten additional arc lamps installed round the docks, for use mostly at the coal hoists, and it has been remitted to the Works Committee to consider the question of more efficiently supplying the whole of the docks with the electric lights. The subject of enhanced graving dock accommodation has also been under discussion, and it was remitted to the same committee to report as to the construction of a new graving dock, of a size and form thoroughly adapted for the larger size of steamships now frequenting the port, on a site adjacent to the extensive new wet dock now under construction.

Of this new wet dock and other works, Mr. Peter Whyte, C.E., the dock engineer and superintendent, gave some interesting particulars in a paper delivered before the Association of Municipal and County Engineers at their meeting recently in Edinburgh. The dock, which it is expected will be ready for opening for traffic by the end of the year 1900, is 1,000 ft. long, 550 ft. wide, and 40 ft. deep. The length can easily be increased to 2,000 ft. at small expense in the future. The dock is being surrounded with walls of solid masonry set in cement mortar, and carried down into the boulder clay 4 ft. below the bottom of the dock. The dock will be entered by a lock 350 ft. long between the sills, 70 ft. wide, and 38 ft. deep from coping to sill. This will give a depth of water over the sill at ordinary springs of 30 ft. 6in., and at neaps of about 25 ft. 6 in. The dock gates are being constructed on the flotation principle, wholly of steel and fine Yorkshire iron. Each pair of gates, with the requisite pivots and roller paths, will weigh about 292 tons. A passage 60 ft. wide and 36 ft. deep will form a means of communication between the new dock and the Albert Dock. It will be fitted with a single pair of gates, also of the flotation type. Besides enabling vessels to pass from one dock to another, this passage will provide practically a duplicate entrance from the harbour to the whole system of the docks on the east side of the harbour; a point of manifest importance in the working of the traffic. The equipment is not yet decided upon, but it may be assumed that the sheds, cranes, and other appliances will be of the best construction and highest efficiency.

Messrs. John Scott & Co., engineers and shipbuilders, of

Abden Works, Kinghorn, on the Fifeshire coast, keep well employed, and have turned out a number of fair-sized vessels this year. The most recent of these, launched on the 18th ult., was a handsomely modelled, and internally highly finished, steam yacht named the *Yacona*, 188½ ft. long, 27 ft. 2 in. beam, and 13 ft. 9½ in. deep, the tonnage being 635 Thames measurement. She has been built to the order of Mr. Walter S. Bailey, commodore of the Yorkshire Yacht Club, and as is the usual custom at Kinghorn shipyard, the vessel was launched with engines and all machinery on board and steam up. Immediately she was launched—an event which was witnessed by about 5,000 spectators—the *Yacona* went down the Firth on a preliminary trial.

Dundee Harbour Trustees were able to announce recently a substantial surplus on the past year's working—no less in fact than £10,800 out of a total revenue of £69,613. This is affording a considerable amount of satisfaction throughout the shipping community of Dundee, as it is thought it may tend to encourage the Trust in undertaking much-needed improvements to the shipping facilities of the port. Engineering and shipbuilding at the port continue in an active state. During the second week in July two vessels of fair dimensions were launched: one of 234 ft. length and 32 ft. beam, by the Caledon Shipbuilding Co. for Messrs. Thomas Wilson, Sons, & Co., Hull, and one of 225 ft. length by 30 ft. breadth, by Messrs. Gourlay Bros. & Co. for Messrs. James Currie & Co., Leith. The Dundee Shipbuilders' Co. also dispatched a new tug steamer to London owners during the week, and another small vessel ran her trial trip. The last mentioned was from the hands of Messrs. White and Mair, of Dock Street Engine Works, who have also received an order for engines and boilers of considerable power for a new steamer which has just been launched at Middlesbrough, and will be taken to Dundee for completion.

The Caledon Shipbuilding & Engineering Co., besides the launch of the screw steamer for Messrs. Wilson, of Hull, above referred to, also during the month completed and tried for speed another steamer for the same owners, the *Otto*. The mean of four runs over the measured mile at Auchmithie was 14 knots, this result being considered highly satisfactory. This company have also completed negotiations with the Dublin and Glasgow Steamship Co. (The Duke Line), for the construction of a high-class passenger and cattle steamer to be engaged in the Channel trade. She will be 265 ft. long, 35 ft. beam, and about 16½ ft. moulded depth, with a tonnage of 1,500 tons gross. Engines will be fitted to indicate about 3,500 H.P., and drive the vessel at a speed of 16 knots. The Caledon Co. have for some little time been negotiating for the construction of a cattle steamer of about 12,000 tons gross measurement.

The Dundee Shipbuilders' Co. have now completed the steel floating dock to the order of the Roumanian Government, which they had constructed at their yard and afterwards shipped in pieces to Galatz on the Danube, where it is now afloat and in proper working order. Only one or two workmen were at first sent with the dock, it being fully expected that competent workmen could readily be engaged on the spot, or that men could easily be trained for the purpose. The Roumanians, however, appear to have had no head for the work, and squads of men had to be despatched from Dundee. The dock, as now moored abreast of the arsenal at Galatz, is intended for vessels of not more than 300 tons displacement, but it has been successfully tested with a vessel of 350 tons. It measures 147½ ft. in length, 49 ft. extreme breadth, and 26½ ft. deep. By an arrangement of sluices the dock chambers are filled, which sinks it to within a few feet of the top. The vessel to be docked is then floated into position, the water is pumped out of the chambers, and the dock slowly rises, bearing with it the vessel, by that time securely shored and steadied. When rid of all water the sill of the dock is about 18 in. clear of its surface, the bottom of the ship being on blocks 3 ft. higher.

By the Workmen's Compensation Act, which came into force on July 1st, a big change is likely to occur in the conditions of employment in the shipbuilding trade. As in the case of many other branches of industry, the shipbuilders have joined in an insurance fund of their own, under the auspices of the Shipbuilding and Engineering Employers' Federation. Any other course was made impossible by the excessive premiums chargeable under the systems adopted by the different industrial insurance companies. What the exact liability under the new Act may be cannot even be approximated to, as there are many accidents which were scarcely taken heed of before that may now entail compensation. In this connection it is of interest to note that the first Clydeside accident to be recorded after the law came into force was that of serious hurt to the arm of a workman through an unintentional blow from a fellow workman's sharp gouge. In drawing up their scheme, which has now been completed, the builders, it can be clearly understood, have been much handicapped by having nothing in the shape of data to go upon. However, a scale of premiums, with a safe margin, has been drawn up, which, after a year or so's working of the Act, can be adjusted as the experience gained may dictate. Since the coming into force of the Act, some big Glasgow firms, it is stated, have appointed special doctors to examine all candidates for employment, and to see that they are hands not likely to collapse while with the establishments. This will, in all probability, tell very heavily on old men seeking jobs, as firms will be loth to take the risk of them, and may appear to many as a cogent reason why an old-age pension scheme should be passed as the logical complement of the other measure.

The fear of a possible breakdown in the electric light arrangements on board ship, and especially of any "giving out" in connection with the side and masthead signal lights, has given rise to devices for automatically calling the attention of the officers in command to any failure or inefficiency in the lights. Several electric lighting firms have devised and fitted into steamers a provision of this highly important kind, and an invention for the same purpose, having features in common with others already in use, has been fitted on board the screw steamer *Ula*, the latest addition to the fleet of the British India Steam Navigation Co., by the builders, Messrs. William Denny & Brothers, of Dumbarton. This firm have for many years had an electrical department in their yard—indeed, were perhaps the first to systematically adopt the modern illuminant, and they themselves do all the installations in the ships they build, the device under notice being a result of their own experience and skill. Briefly described, the arrangement consists in having an indicator-board in a conspicuous position in the chart-room, in which are three small round openings. Each opening is provided with differently coloured glasses, the centre one being frosted, while those to the right and left have green and red glasses respectively, these corresponding to the masthead and starboard and port side-lights in colour. The indicator case and its openings are in communication electrically with the leads transmitting current to the signal lights. When the latter are burning all right the openings in the indicator are illuminated correspondingly, and if by any means any one or all of the lights become extinguished a corresponding result takes place in the chart-room. This is, of course, at once observable to any occupant, but, in addition, an alarm bell rings, and continues ringing until attention is drawn to the circumstance of the light failure and measures taken to have it set right. This is the first ship in which Messrs. Denny have fitted such an obviously valuable device, but it is likely to be an invariable part of the electric installation on board all the ships they build.

THE TYNE.

(From our own Correspondent.)

Shipbuilding.—The wages question in the shipyards is now practically settled, the representatives of the "black squad" having succeeded in inducing the employers to alter the offer of 1s. weekly on time wages to one of 1s. 6d. weekly, which is the increase given to the shipwrights and joiners. So far as wages are concerned, therefore, no disturbance of friendly relations between the employers and the workmen is likely to occur during the present year; but as wages do not constitute the sole point of possible difference between capital and labour, we will not say that this settlement necessarily secures the shipbuilders against all possibility of strike stoppages during the next six months.

The questions of lost time and "overtime" are now being dealt with, and though it is understood that an agreement with respect to the former has been arrived at between the two organizations of masters and workmen, it appears that such is not the case in respect of the latter. A proposal has been made and is now being voted upon by the different branches of the Boilermaker's Society, which is to the effect that no more than 16 days "overtime" can be worked in establishments having a maximum of 50 men employed, the amount of overtime to be increased in a proportional ratio where the number of men employed exceeds

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that number. Whether this scheme is adopted or not, it seems to us one to be unreservedly condemned, inasmuch as it involves abrogation of the employers' right to conduct their businesses in whatever way seems best to them. The claim of the trade union to regulate the hours to be worked in a shipyard or factory is preposterous, though in the armour of self-appreciation with which they have clothed themselves, the trade unionists do not appear to see or feel it.

As members of a trade union it is as absurd for them to dictate to the employers as to the time during which he may run his machinery as it would be for the employer to claim the right to make the union rules, or to fix the union meetings. Either of the proceedings named is an unwarrantable encroachment by the one side upon the obvious rights of the other, and all who are imbued with a sense of justice will treat the encroachment in both cases with an equal degree of resentment. The truth is that it is time these tinkering efforts to set aside natural laws in the interest of a class, or of classes, should be put an end to; the trade competition of other countries being now so keen that English capitalists and manufacturers must be enabled to enter the lists with hands as free as their opponents.

Neither of the two new shipyards about to be started on the Tyne have as yet commenced actual productive operations, though the preparations to that end are being pushed on as rapidly as possible. The other yards being now so full of work, there will doubtless be a difficulty in providing skilled labour for the new ones, especially with the conditions in force, that are imposed by the trade unions, and which imply that where the latter are in a majority, no non-union men shall be permitted to work. A fine opportunity is now afforded for the trial of an experiment on the Tyne, which was inaugurated on the Wear some years ago, and having answered every purpose, has never been abandoned. We refer to the carrying on of a shipbuilding business independently of trade union labour, or at all events of that class of union men who are employed in connection with the plating, rivetting and caulking. Competent non-union workers in the lines mentioned, are numerous enough in the northern towns, a fact which would be speedily demonstrated were scope afforded for the utilisation of their services. Even if the supply should prove inadequate, the work is so simple in itself, that under intelligent management, the smarter men among the labourers could in a remarkably short time be made proficient in the branches of trade referred to.

During the month just passed, there have not been any considerable additions made to the contracts on shipbuilders' books, the fact being that in no case has there been any strong desire manifested for adding to prospective engagements. We hear, however that Messrs. Wigham, Richardson, & Co. have contracted with a French firm for the building and engining of three superior type steamers, and this will probably preclude the possibility of any further contracts being accepted for some time to come.

Messrs. C. S. Swan & Hunter are booked heavily forward in shipbuilding, but have not as yet secured any further contracts for the pontoon yard. We understand, however, that the firm are in negotiation for some important work in this line, and there is good reason to expect that before many weeks have elapsed, the unique facilities possessed by the firm for pontoon building, will again be in use. The "glazing" of the shed roofs in the firm's east yard is now well advanced, and in a short time the men employed on the ships building in those sheds, as well as the ships themselves, will be under shelter from sun and rain. It would seem that in this country, shelter from the sun is scarcely necessary at any time: but to work under a strong sun, surrounded by rivetters' fires, is by no means pleasant, and we are pleased to hear that the shelter afforded by the glazed roofs of these sheds is much appreciated by the workmen, some of whom have stated that the space under the glazed portion of the roof is much cooler than where the roof is still open. Shelter from rain is of course of much greater importance, and this advantage will, it is expected, admit of work being carried on uninterruptedly in winter as well as summer. The men will thus become habituated to such regularity of working as was hitherto impossible in shipbuilding, a change which seems fraught with results of the best kind, to the industry and the district.

It is reported that Messrs. Armstrong, Whitworth & Co. have booked orders for several oil carrying steamers, to be built at the Low Walker yard, where arrangements are now being made for putting down the big boat ordered by the West India and Pacific Steam Navigation Co.

The Palmer Co. have full share of work, to which their position and reputation as a shipbuilding firm of the highest standing entitle them, and the whole of their departments are consequently as busy as could be wished. The Co. have launched a good many vessels of a large type this year, and there being less Government work in hand than was the case last year, the output for the current twelve months will probably be greatly increased.

Messrs. W. Dobson & Co. have a large vessel in the plating stage, and two others less advanced. The firm are fitting out a vessel in the water, and have full complements of men employed both ashore and afloat. Messrs. Wood, Skinner & Co. have four vessels in progress, and have at least as many that are not yet commenced with.

The Tyne Shipbuilding Co. have a couple of large vessels on the stocks, besides one of smaller dimensions. The firm are fitting out for sea the fine vessel that was recently launched from the yard, and are expected to start night work in the framing department shortly.

At Messrs. Readhead's yard undiminished briskness is to be noted, there being a couple of vessels getting fitted out in the water, besides those in course of construction on the stocks. The small yards at North and South Shields are quite busy, and orders for fishing vessels have been recently booked. At the repairing establishments there is a fair amount of work doing. and both graving docks and slipways are pretty fully occupied,

Engineering.—We expressed the opinion in last month's notes that the claims of the engineers for an advance of 5 per cent on piece prices and 2s. per week on time rates would be settled by the employers conceding half what was asked for, and the event has proved our forecast to have been correct. A settlement has been effected on the basis mentioned, and by this act of magnanimity the employers have shown how baseless were the charges of those who a few months ago were constantly describing them as "callous" and "grasping." It cannot be denied that the employers might have declined to give any advance whatever at the present juncture without fear of consequences, as the engineers were powerless to enforce the demand. If the action of the employers should, however, tend to promote the growth of sensible views amongst the men, and disabuse their minds of foolish prejudices, it will produce such an equivalent in the way of improved relations between capital and labour as will more than counterbalance any temporary loss that may fall upon the employers through their liberality.

At all the leading marine engine works night shift is still the rule; but even with this important, though expensive, aid to production great difficulty is experienced in bringing the output up to requirements. At most of the works vessels are being fitted with their machinery, and in several instances others are waiting to be equipped, precedence being usually given to those longest in the water.

Messrs. Noble & Lund, engineers' tool makers, Felling, are well supplied with orders for their various departments, and will shortly be in a position to commence productive operations in the large foundry they have added to their premises. They are particularly busy in the manufacture of Mudd's patent piston rings, and have booked a number of important orders for this speciality during the month. The firm are giving special attention to the production of labour-saving tools for engineering works, and have now in course of construction or on order for firms at different centres several examples of a newly-designed machine, which will doubtless be much in demand later on. This is a duplex horizontal drilling and boring machine, specially adapted for the connecting rods, piston rods, crank webs, &c., of marine engines. The firm have also several orders for monstre band saws of the type previously manufactured by the firm for large engineering works on the Clyde, Thames, Humber, &c.

Messrs. Thos. Proctor & Son, of the Side, Newcastle, have a full share of the work that is going in such steamship accessories as ventilators, tanks, signal lamps, &c., and are at present engaged in the equipment—so far as the lines named are concerned—of some of the finest vessels ever built on the North-East coast. Their extensive manufacturing works at Gateshead continue exceedingly busy, and we believe an extension is contemplated.

Messrs. Robt. Bowran & Co., of 8, St. Nicholas Buildings, have during the present year received some exceptionally important orders for the supply of "Stockport" gas engines of a high grade to many of the principal engineering and shipbuilding works in the North. It would seem that where large power is required there is a decided preference for this kind of gas engine, the simplicity of its self-starting arrangement being one of its strongest recommendations. The Blaydon Forge Co.'s works are kept going briskly, the orders for ship and engine forgings being very numerous. In other forging establishments business is also good, and both iron and brass foundries are very fully employed.

There is now being put upon the market a very useful article, the sole agents for which are Messrs. Adamson & Co., of Tyne Dock. This is "Henry's patent fire brick," which is said to stand a higher degree of heat than any other fire brick as yet manufactured. The power of resisting high temperatures possessed by these bricks is not, however, the only advantage connected with them, as they are very much lighter than ordinary fire bricks, and will last much longer. They are specially adapted to water-tube boilers, and have been tried with signal success in several of her Majesty's ships. They were supplied to the torpedo-boat destroyer *Whiting*, which on a trial had one of her furnaces suddenly cooled down from a white heat with the drencher. The bricks stood this rather trying test without the least injury, and the vessel sailed from Portsmouth for China with the original bricks that were put in. Messrs. Adamson are supplying special arch quarls for the furnace bridges of merchant steamers, and these are turning out an unqualified success.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—The committee of the Sunderland Corporation, which has to deal with such matters as the diversion of public roads or footpaths, has apparently fallen foul of Messrs. Doxford, in the matter of a new road which the firm proposed to construct, in substitution of an old one which was an obstacle to certain contemplated alterations and extensions. The firm desired to make the road in a position which would suit the convenience of themselves and their workmen; but the committee, it would seem, wished to have it where—in their view—it would meet the convenience of the general public, and in this way the hitch, or misunderstanding has arisen. Messrs. Doxford are bound to be the victors, however, as public opinion is with them, and the belief is current that they would remove their business to some other centre rather than bow to the will of the local authority.

Messrs. Short Brothers are about to put down plant in the additional premises which they acquired a couple of years ago, but which have as yet only been utilised for repairing purposes. Their decision to equip the place with suitable shipbuilding plant indicates the likelihood of one or two vessels being put down in the berths, and it is expected that this will be done before the year is much older.

Messrs. J. L. Thompson & Sons have two large vessels in the plating, and three in framing stages, besides a couple of vessels at the Manor Quay Works being fitted out. Large quantities of material are being delivered at the yard, and satisfactory progress is being made with the work in hand.

At Messrs. Blumer & Co.'s yard all the berths are filled, and it is understood that the machinery equipment of the establishment is about to be largely increased. The Strand Shipbuilding Co.'s yard is also well employed, and it is understood that in addition to prospective repair contracts there is another locally ordered vessel to be put down. Sir James Laing's, Messrs. Robt. Thompson & Sons, and Messrs. Priestman's yards are as busy as ever, and the same may be said in respect of the two establishments at the south dock. Messrs. Pickersgill and Messrs. Austin & Sons are fully supplied with work, and at Messrs. Osbourne, Graham & Co.'s yard, North Hylton, business is better than for some time past.

Engineering.—If Wear-side engineers have been somewhat backward in the matter of invention it appears that the character of the district will soon get a lift in this respect, as a watertube boiler, designed by a local man, is about to be put upon the market. We cannot speak definitely of its qualities at present, but we are assured by engineers who have seen the design that its principle is sound, and that owing to the simplicity of its construction it can be more cheaply made and more easily managed than any water-tube boiler now in use.

At the Southwick Engine Works, the fine Japanese passenger steamer recently launched from the yard of Sir James Laing, is receiving her machinery, and at Messrs. Doxford's Works there is a large turret ship being fitted. Some repair contracts of more than ordinary importance have come to supplement the very large amount of new work now in hand at the Palmer's Hill Works, and at other local establishments the business previously reported is maintained.

The Hartlepools.—It is reported that an order for two exceptionally large steamers has been placed with Messrs. Furness, Withy & Co., by a Manchester firm, who have also placed an order for a boat of smaller size with the Irvine Shipbuilding and Dry Dock Co. All these vessels are to be electrically lighted, and supplied with every recently-devised accessory to aid in rapid loading and discharging. The engines will probably be supplied by Messrs. Furness, Westgarth and English, though of this we are not, at the moment, quite sure. Three vessels have been launched from Messrs. Sir William Gray & Co.'s yards during the week ending July 23rd, which must be considered a somewhat remarkable achievement. Both the Hartlepool and the Central Marine Engine Works are full of orders; the former, we believe, have some exceptionally important work in hand for vessels building on the Tees.

Stockton.—At all the yards here business continues brisk, and both boiler shops and bridge works are equally busy. Engineering establishments still show the very greatest activity, Messrs. Blair having as many orders as they can deal with. Messrs. Riley Brothers, notwithstanding the extensions they have made, are barely able to cope with the orders coming their way, and cannot now guarantee delivery quite as promptly as they were wont to do some months ago. At all the steel works and rolling mills a pressure of work exists.

Middlesbro'.—In addition to other important work it is understood that Messrs. Sir Raylton Dixon & Co. have a superior vessel to build for the Indo-China Steam Navigation Co., and Messrs. Craggs have accepted one or two further contracts for delivery next year. Engineering works are busy, and the same statement applies to bridge works and foundries. The whole of the steel works are booked a long way ahead, and the prices of steel plates, &c., are very firm. At the docks business continues to show improvement.

Consett.—The immense resources of the Consett Iron Co. appear now to be rather severely taxed; but the managers of the various departments are making all possible efforts to meet customers requirements, and it is certain that the weekly output is larger than ever.

THE MERSEY.

(From our own Correspondent.)

NO slackening off whatever is apparent in the almost unprecedented activity which has prevailed throughout all branches of the engineering trades in this district, practically ever since the termination of the late protracted dispute, nor is there any present indication that this very satisfactory condition is not more than probable to continue for some time to come. New work is still coming forward freely, and in ample quantity to replace orders that run out; in fact, the pressure is so great, and so likely to be maintained, that in all directions extensions of plant or enlargements of works are either being pushed forward or in contemplation at most of the leading engineering establishments throughout this district. To particularise special branches of engineering that are experiencing exceptional pressure of work would be simply a repetition of precisely similar remarks in describing the position of practically every section of the trade, but it may be mentioned that marine engineers perhaps never before had so large a weight of orders in hand for all descriptions of both light and heavy tools, whilst the large gun makers and manufacturers of war material are exceedingly busy in every department.

The shipbuilding firms on the Mersey continue full of work, and Messrs. Laird Bros. have completed several important vessels with very satisfactory results. The *Wolf* torpedo-boat destroyer has been taken over by the Government, and this makes in all ten 30-knot boats that Messrs. Laird have designed, built and engined for the British Government, and which have all passed through their trials in every way in a most satisfactory manner. The Argentine training ship, *Presidente Sarmiento*, built by Messrs. Laird, has also sailed, having satisfactorily completed her speed, coal consumption, and gunnery trials. Messrs. Laird have laid the keel for a new fast South Eastern boat to run between Folkestone and Boulogne. This boat, it may be added, is being specially built for the 'cross-Channel traffic in connection with the 1900 Paris Exhibition, and is an improvement on the *Princess of Wales* just completing for the same company.

Although to some extent the engineering trade unions are still feeling the effects of the late disastrous dispute, the reports which are sent out from month to month show that the position as regards employment is steadily improving, but here and there the number of members out of work is still above the average. The Amalgamated Society of Engineers this month again reports a further reduction of unemployed members, the returns being 350 less as compared with last month.

The monthly report of the United Machine Workers' Association shows a reduction of two per cent. in the out-of-work list, which now represents only a little over four per cent. of the membership, Bolton and Oldham being responsible for nearly two-thirds of the total unemployed list. In the Manchester district there are less than three per cent. on out-of-work donation. The Steam Engine Makers' Society continues in a most satisfactory position as regards the employment of its members, only one per cent. being reported on donation throughout the society, whilst in the Manchester district, and also in other important Lancashire centres they have practically a clear book. Reports as to trade are of a most favourable character, activity being prevalent in practically all centres, especially on marine work, in connection with which Northern establishments are exceptionally busy.

A few notes with regard to a visit to the important engineering works of Messrs. Wm. Muir & Co., Limited, Manchester, well-known for their special machine tools for marine and other work, will be of interest. Amongst a number of special tools they had in hand one particularly noticeable was a large horizontal drilling, tapping, studding and boring machine, having a 6 in. spindle, with 36 in. self-acting feed traverse, a vertical range of 10 ft., and horizontal range of 12 ft., with three separate ratios of fixed feeds for drilling and boring the larger holes in various classes of marine work. The driving of this machine is through heavy spur and cut steel bevel wheels; the upright is of massive proportions, working upon an exceptionally wide bed, and the whole of the movements of the uprights, spindle slide, and spindle, can be worked simultaneously or separately by hand or power motions controlled from the spindle slide. The above tool was being built for an eminent marine engineering and shipbuilding firm on the Tyne, and for the same firm Messrs. Muir had in hand an exceptionally large vertical milling machine for milling connecting rods, crank-webs, &c.

Amongst other noticeable tools in hand was one for boring and planing out torpedo tubes, and the firm had also in course of construction several screw-cutting and large chuck lathes, numerous vertical, profile and general milling, slotting, and drilling machines, and we noticed a new departure in the arrangement for driving lathes by electric motors, in which the two speed motor was placed upon a bracket attached to, and immediately over the fast headstock, so that the whole of the machine was self-contained, and took up no more room than an ordinary belt-driven lathe, whilst the high velocity of the motor enabled exceptionally small four-speed cones to be used for the 24 variations in the speed. A similar adaptation of the above arrangement had also been recently applied to a radial drilling machine in which the mechanical motion could be instantly changed from a quick-drilling speed to a slow-tapping speed by the simple movement of a lever.

Another special tool was an exceptionally large double vertical-spindle profile and general milling machine, which Messrs. Muir had just completed for an electrical company in the Midlands. In this machine, which, it may be added, is the largest of its type that has yet been made, the cross-slide is of very massive construction, and so arranged that the balance-weight for the cross-slide is placed in a pit under the machine. The cross-slide is operated by power, up and down the face of the uprights, which are of heavy box pattern. The transverse carriages on the cross-slide have independent, variable, and reversible self-acting feeds, which can also be operated by hand, with releasing motions to the screw for quick traverse, by hand wheel, pinion and rack. The right-hand carriage and spindle will traverse the full width and area of the table, which is 8 ft. wide by 12 ft. long, by over 9 ft. between the uprights, and 4 ft. between the cross slide, when in highest position, and the top of the table. The spindle slides are adjustable vertically by screws, and also by hand-wheel. Each of the spindles which are of hard steel, is driven by independent cones, and double and treble spur and cut bevel steel gear, and they are arranged for milling cutters from 2 in. up to 18 in. diameter. In connection with each carriage and spindle there is a centrifugal pump, with fittings and connections for lubricating the cutters with soap and water when milling steel. The whole machine is of massive construction, and occupies a floor space of 24 ft. wide, by 26 ft. long, the total weight being about 40 tons, independent of the balance weight, which in itself weighs upwards of six tons.

Messrs. Kendall & Gent, the well-known machine tool makers, of Manchester, have erected entirely new works adjoining the Belle Vue Station of the Great Central and Midland Railways. These new works present many special features, in that they are electrically driven and lighted throughout, and also as regards their general design and arrangement. They have a handsome frontage to the railway, and are well equipped with commercial offices, technical departments, and commodious, well-lighted drawing offices. The main building is a large erecting shop divided into four bays, 280 ft. long, and each about 40 ft. in width, lofty, and well-lighted from the roof and sides. Practically this shop is divided into two sections; for light work on the one side, and heavy work on the other, with the principal tools in the two central bays, which are traversed from end to end by electric three-motor travelling cranes, whilst each bay is served respectively by lighter tools for the special work in the two outside bays. The arrangement of the various tools is carefully carried out on the rotation system, so that the work has not to pass over the same ground twice. The shop is in direct connection with the main railway line, by means of a special siding, which brings the trucks inside the building and underneath the travelling cranes. In addition to the tools on the ground floor a couple of galleries carried over the side bays serve for light tools. In laying out the electric power for driving the whole of this shop, the group system has been adopted. The central generating station, which is outside the shop, consists of an installation of two independent dynamos developing 200 H.P., which can be used separately for lighting or driving, or for both, and in combination as necessity may arise. The motors for driving the different groups of machines are mainly 20 H.P., but for lighter work they run as low as 10 and 5 H.P., whilst the cranes are on the three-motor system throughout. As it is necessarily a matter of very great importance in engineering work that the power required to drive each of the machine tools should be carefully ascertained, in the introduction of electric driving, there is attached to each motor an ammeter, from which records are taken. Outside the main shop are lofty, well lighted buildings for the smithy and pattern shops, with the plant all electrically driven, and large pattern stores.

In connection with the notice, in our last issue, of the "Swift" patent handpipe and nozzle, which is being introduced by Messrs. John Morris & Sons, Salford Fire Engine Works, Manchester, it may be mentioned that one or two of the special advantages claimed for it by the inventors were perhaps scarcely brought into sufficient prominence. The invention may be described as a "smoke-driving" nozzle, as it affords complete protection to the fireman against smoke and heat, enabling him to cope with the outbreak of fire at close quarters. This object is accomplished by means of the special combination of stream and spray. The fireman can play upon the fire with a powerful, solid stream of water, whilst he is himself protected from smoke, heat, noxious vapours, &c., by the spray, which can be deflected to any angle.

In a recent issue we noticed a novelty in deck seats, by which a dry and clean surface is ensured in all weathers. Since then, the inventor, Mr. Wm. English, of Manchester, has introduced several important improvements in the construction of the seat. The novelty, as we have previously pointed out, consists in a revolving cover for the seat, formed of narrow strips of wood. The improvements introduced consist principally in providing a roller in the rear of the seat, which not only enables the cover to be more freely moved round, but considerably lightens the weight of the seat. Other improvements include the introduction of a Λ-shaped drip ledge at the rear of the seat, which in addition to being a protection during rainy weather, prevents any moisture being thrown on the dry portion of the seat whilst it is being revolved; the wooden ribs of the seat are now firmly riveted to pegamoid bands, which are impervious to wet, and in addition to the india-rubber scrubber below, which takes off the heavy rain drops, a felt drier has been added which still further removes all moisture, so that the portion of the covering that has been exposed to the weather is quickly dried and ready for use when the cover has again to be revolved.

Amongst the many industries brought into being by the Manchester Ship Canal is the supply of sea water to the Lancashire public, which is undertaken by the Pure Deep Sea Water Supply Co. The sea water is brought to Manchester by the 'cross-Channel cargo steamers which arrive daily at the docks, and as these vessels are carrying cargo each way, they do not require to use their spare ballast tanks, which are filled for the Co. outside the 20 fathom limit, so that the water is absolutely pure. When the vessels arrive at the docks the water is pumped from the ballast tanks into small 200-gallon tanks, which are lifted on to carts and the water is sent round to the various districts for sale.

The iron market here maintains a strong position. So far as pig iron is concerned, although the weight of business coming forward is only limited, there is more enquiry stirring, whilst as regards prices makers hold firmly to recent quotations, and there is comparatively very little underselling on the part of merchants. In local and district brands some fair transactions have been put through in forge qualities, on the basis of about 46s., less 2½ for Lancashire, and 44s. 2d. for Lincolnshire, net cash, delivered Warrington. Foundry qualities are firm at 49s. 6d., less 2½ for Lancashire, 46s. for Lincolnshire, and 50s. to 51s. for Derbyshire net, delivered Manchester. Outside brands offering here have fluctuated rather during the past month. The average figures for Middlesbrough are now about 49s. to 49s. 7d. net, delivered by rail Manchester, with Scotch iron, about 50s. to 50s. 3d. for Glengarnock, and 50s. 6d. to 50s. 9d. for Eglinton, and American pig-iron from 47s. 6d. up to 50s. net cash, according to brand, delivered Manchester Docks, but very little doing.

In the finished iron trade bars have shown an upward move, and the basis rates have been advanced 2s. 6d. per ton on Lancashire qualities, and 2s. 6d. to 5s. on North Staffordshire, the minimum prices being now £5 17s. 6d to £6 for Lancashire, and £6 2s. 6d. to £6 5s. for North Staffordshire bars, delivered Manchester district. Sheets are without improvements, averaging £6 17s. 6d. to £7 2s. 6d., and hoops are only in limited demand at the association list rates of £6 10s. for random to £6 15s. for special cut lengths delivered Manchester district, and 2s. 6d. less for shipment.

Exceptional activity is maintained in the steel trade, and there has been a further hardening in prices, especially for manufactured materials. No. 3 foundry hematites are firm at from 61s. to 62s. for special brands, less 2½, and local billets £4 10s. net cash. Bars range from about £6 2s. 6d. for some local makes, up to £6 10s. and £6 12s. 6d. for special brands. Makers do not now quote under £6 12s. 6d. for common steel plates, although merchants have been selling at 2s. 6d. less. For steel boiler plates the general quotation is now £7 per ton, delivered in this district, which is 2. 6d. to 5s. above last month's prices.

In the metal market a firm tone continues to be reported, and all classes of manufactured goods suitable for engineering and marine requirements meet with a good demand, whilst prices are well maintained at full list rates. Delivered in this district quotations remain as under:—Brazed brass tubes, 8¼d.; common rolled brass, 6½d; common brass wire, 6½d.; and copper wire, 7½d. per lb.

Imports of timber have been moderate, and deliveries fair, but there is still a lack of animation, with little confidence as to the future. Owing to the serious decline in ocean freights values of most articles are lower, and sales can only be effected with difficulty. Stocks, however, are for the most part not excessive. The import of teak logs and planks has been light, and a tolerably satisfactory demand has come forward, but prices are rather easier, and stocks sufficient. Two cargoes of greenheart have arrived, and there has been a good consumption, but stocks are ample.

In the coal trade here an exceptionally steady tone is reported for the time of the year, and except as regards house-fire qualities, a fairly active business is coming forward in all descriptions of fuel. The limited demand for house-coal is necessarily due to the season of the year, and the restriction of requirements is causing an accumulation of stock at local collieries, with, in some cases, pits having to go on short time, but so far as prices for the better qualities of round coal are concerned, it is exceptional where any concession is made on the rates recently ruling, and the average quotations at the pit-mouth may still be given at about 10s. to 10s. 6d. for best Wigan Arley, 8s. 6d. to 9s. for Pemberton four-foot and seconds Arley, and 7s. 6d. for common house-coal, whilst contracts with merchants are only being settled at an advance on last year's rates. Steam and forge coals are meeting with a ready sale, and prices are very firm at about 7s. to 7s. 6d. per ton at the pit-mouth. With regard to engine fuel the output is rather limited at some of the local collieries, but with fairly ample supplies coming in from other districts there is no actual scarcity in the market. At the pit-mouth prices are steady at about 4s. 6d. to 5s. for best qualities, 4s. to 4s. 3d. for medium, and 3s. 6d. to 3s. 9d. for common slack. With regard to forward contracts a general advance over last year's prices, equal to 3d. to 5d. on engine fuel, and 6d. to 9d. on round coal is being got. In some cases colliery proprietors in arranging contracts over the ensuing twelve months are putting on a special advance to cover the extra cost of the Compensation Act, and either introducing a sliding scale regulating the price according to wages, or putting on a direct advance to cover what they consider the probable upward move in wages, as a result of the agreement between the miners and coalowners representatives.

The shipping trade has been active during the month, and steam coal, delivered Mersey ports, is selling at from 8s. 6d. and 8s. 9d. up to 9s., according to quality.

THAMES.

(*From our own Correspondent.*)

THE Thames Iron Works, Ltd., are fairly well up in orders. Lately they have made a speciality of marine engineering work. At present they are engaged on ten sets of 40-ft. furnace machinery for the sloop *Condor*. Orders are also being executed for the Russian Government. At present their works are engaged on two 56-ft. pinnaces, and also one 40-ft. for the same. Progress is being made with the Japanese battleship, and with two 56-ft. pinnaces and their machinery for the same government. This firm builds all the life-boats for the Royal National Lifeboat Association, and are at present engaged on the *Irvine* life-boat. They are also engaged on one life-boat for the Cape.

The much-needed yacht for the Thames Conservancy is being built by Messrs. R. & H. Green, Ltd., and is on the stocks at Blackwall Yard. Her dimensions between perpendiculars is 130 ft., beam 19 ft., and depth 11 ft. 6 in. Her engines are being constructed at Stewart's Engine Works. Messrs. Green are also building a lightship for the Trinity Corporation. She is to be composite, of steel and wood sheathed. They have also in hand 14 barges for Wm. Currie & Son, and one barge for the West Kent Portland Cement Co. The work of repairs in the dry docks is fairly busy.

John Penn & Sons are at present busy with the machinery for H.M.S. *Goliath*. The engines are triple-expansion, and are to indicate 13,500 horse-power. There are 20 Belleville boilers to be fitted in, and these, too, are being made by the firm in the boiler department. The *Pactola* has just been fitted with eight Blechynden boilers; the engines are to indicate 7,000 HP. The *Pactola* is a new third-class cruiser; it was built at Newcastle, and has just been ordered to undergo a 30-hours coal-consumption trial. The firm has also just fitted eight boilers into the cruiser *Pomona*. They also are of the Blechynden type, and the engines are to indicate 7,000 HP. These boilers are the first which the firm has fitted of this type, and it will be interesting to follow the trials, and learn the results.

The yards of Messrs. Yarrow of Poplar are as usual full from end to end, and more are to be laid down as soon as those in a forward state have been launched. At present there are four destroyers on the stocks for the Japanese Government. The dimensions of these are 220 ft. 3 in. in length, 20 ft. 6 in. in breadth, and 13 ft. 6 in. deep. The engines have four cylinders, and are triple expansion. The destroyers have twin screws. The speed is to be 31 knots per hour. Each boat is to be fitted with four boilers of the Yarrow type. The engines are to indicate 8,000 horse-power. The transverse shape of the lower drum of the Yarrow boiler has been departed from in these boilers. The tubes in the ordinary type are expanded into a flat plate, which is bolted into a vessel semi-circular in section. The shape of the plate into which the lower ends of the water-tubes are expanded are cylindrical in section, but the radius of curvature is much larger than the radius of the lower drum. There is also on order and on the stocks four torpedo boats for the Austrian

Government. The dimensions of the torpedo boats are 152 ft. 6 in. in length, 16 ft. breadth, and 3 ft. draught. The engines are three cylinder triple expansion inverted vertical type, and are to indicate 2,000 horse-power. Each torpedo boat will be fitted with two Yarrow boilers. The speed of the propeller is to be about 400 revolutions per minute. One of these torpedo boats was launched last Saturday. The shops are in full work.

BELFAST.

(*From our own Correspondent.*)

NOTWITHSTANDING the continued activity in all the departments of marine engineering and shipbuilding here, there are no launches whatever to report this month. All the principal shipbuilding and engineering works have been closed for the past ten days for the midsummer holidays, which in some measure accounts for the universal lack of output of vessels, but it is anticipated that several launches will take place early next month.

The s.s. *New England*, as mentioned last month, left this port on 30th June for adjustment of compasses and trial trip. This steamer has been built by Messrs. Harland & Wolff, Limited, of this City, for the Dominion Line, and it is fully expected she will be one of the fastest liners between Liverpool and Boston. She is upwards of 565 ft. long, and her gross register is nearly 12,000 tons. She is fitted with twin screws and triple-expansion engines, on the builders' balanced four-cylinder system, which ensures great freedom from vibration and smoothness of working. After a remarkably quick passage across to Liverpool, where she was to load, the *New England* took her departure on 2nd July, and it is to be regretted that the action of the Canadian authorities in taking the mail service away from the Dominion Line should have precluded this fine steamer from sailing to Montreal, as was originally intended, as the change cannot fail to injure Canada, while it benefits Boston.

On 9th July the s.s. *Indore* ran a very successful preliminary trial trip on Belfast Lough. This vessel has been built by Messrs. Workman, Clark & Co., to the order of Messrs. Edward Bates & Sons, of Liverpool, and will sail between that port and Baltimore and other principal American ports. Her dimensions are as follows:—Length, 480 ft.; breadth, 52 ft.; depth, 38 ft., with a gross tonnage of 7,300 tons. She has been built to Lloyd's spar deck class, under special survey, and she has the Board of Trade passenger certificate. Three complete steel decks are fitted, and also a tier of orlop beams, and the vessel is subdivided by seven watertight bulkheads. She has accommodation for a large number of cattle under the shelter deck, which extends right fore and aft, and also on the bridge. There are eight cargo hatches, with a complete arrangement for working cargo. A complete double bottom extends fore and aft for water ballast. The vessel is lighted throughout with electricity, and the auxiliary engines for steering and other purposes are of the most approved type. Her machinery has also been supplied by her builders, and steam is supplied from four large steel boilers at a high pressure. The officers' quarters are placed in steel houses on the bridge, and are tastefully and comfortably fitted up.

During the month the new s.s. *Magpie*, owned by G. & J. Burns, and built on the Clyde, has been placed on the 'cross-Channel service between Belfast and the Clyde. She is a splendid addition to this extensive fleet. This steamer has several important improvements for the comfort of passengers, such as having the dining saloon below the cabins, and being a much larger and faster steamer, will no doubt become the popular favourite on this route. She will be followed very shortly by a sister ship named the *Vulture*, which is nearly completed.

Another magnificent steamer has just been added to the Fleetwood Line from Belfast, showing that the port of Belfast is still advancing, and requiring the services of such a fine fleet of passenger steamers as any City might well be proud of.

Auxiliary Yacht.—On June 11th there was launched at New York, for Mr. A. Watts, a vessel 254 ft. over all, 200 ft. keel, 34 ft. 6 in. moulded breadth, and 12 ft. 6 in. draught. The engines, designed specially for space, indicate 1,600 HP. The vessel is rigged as a full-rigged ship, and will be the only auxiliary yacht in America.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—The shipbuilding and marine engineering trades of Barrow are very busily employed, and there are indications that the activity at present displayed will soon be intensified, and that some very good orders will be added to the already large programme of work in the hands of builders. This position will to some extent be encouraged by the fact that great developments and extensions are being carried out at the Naval Construction Works of Messrs. Vickers, Sons & Maxim, which will enable the company not only to increase its tonnage of production and I.H.P. of engines built, but will ensure a more speedy delivery of orders than is under present circumstances possible, and yet under existing conditions this company anticipates being able to deliver the new line-of-battle ship *Vengeance*, building for the Admiralty, in record time. This vessel will probably be launched this autumn. She is well forward in construction, and will soon be handed over to the Admiralty, although a delay will naturally occur in reference to the completion of her engines, the work in the engineering department of the Naval Construction Works having been sadly delayed by the engineers' strike. Further than this, the construction of so many Belleville boilers for Admiralty ships is keeping several tools employed which ordinarily are engaged on engineering work pure and simple. If there is to be a continuance of the work of building Belleville boilers at Barrow, it will be necessary either to make a special department of it or extend the present engineering shop. The latter is at present being increased 33 per cent. in size and filled up with special machinery for dealing with gun mountings, &c.; but even with this the yearly average of I.H.P. will necessitate still bigger workshops and a further increase in the already very valuable and modern machinery which is congregated in them at present. The launch of H.M.S. *Amphitrite*, first-class cruiser, is dealt with in another column. It is only necessary here to note that the launch was one of the most perfect and most successful that have taken place in the history of the Barrow yard, and the technical observations taken on board and ashore by experts go to prove that no difficulty may be expected under similar conditions in the launching of any vessels from the Barrow yard. The ground is sound and firm, the declination is just at the right degree, and the launching area is wide and deep. The new armoured cruiser *Hogue* is being put down on the same ways as the *Amphitrite* was launched from, and already her keelplate has been laid. It is worthy of note that Messrs. Vickers, Sons & Maxim have sent in a tender for one of the two additional armed cruisers required by the Admiralty, and that they also are tendering for the sloops which are embraced in this year's naval programme. Much progress is being made with the two Clan Line steamers and the two British and African steamers, and with the promise of so much additional new work in store, it is anticipated that these four ships will soon be launched. The new Pacific liner is being proceeded with, and her frames are being prepared. Altogether, then, the outlook in the shipbuilding department is very satisfactory, and every effort is being made to push the work forward as quickly as possible to make room for still further orders.

The New Shipbuilding Yard and Docks now in course of construction at Nicolaieff, will accommodate two line-of-battleships, three cruisers, and several torpedo-boat destroyers under construction at one and the same time. The company which is building the plant has already received a contract from the Russian Government for an armoured cruiser of 8,000 tons, and other Government orders are pending.

The Durham College of Science, Newcastle-on-Tyne.—The Council invite applications for the lectureship in electrical engineering, which has recently been created. The remuneration attached to the post is a fixed stipend of £200 and one-third of the fees of the classes taught by the lecturer, a minimum income of £250 from both sources being guaranteed. Candidates must be thoroughly qualified mechanical engineers. His appointment will date from October 1st, and may be terminated by three months' notice from either side. Applications and testimonials must be sent, not later than August 10th, to Mr. H. F. Stockdale, secretary.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Forwood.—On June 6th there was launched at Hull an iron steam ketch of about 181 tons gross, named the *Forwood*, for Messrs. Hollingsworth & Double.

Walwyns Castle.—On June 23rd there was launched at Hull an iron steam ketch of about 150 tons gross, named the *Walwyns Castle*, for the Castle Steam Trawlers Co., Limited.

Hiso.—On June 24th Messrs. Short Brothers launched from their shipbuilding yard at Pallion, Sunderland, a handsomely-modelled steel screw steamer, built to the order of Mr. C. T. Boe, of Arendal, of the following dimensions, viz.:—Length, 255 ft.; breadth, 36 ft. 9 in.; and depth, moulded, 20 ft. 4 in.; with a deadweight carrying capacity of about 2,550 tons. The vessel, which is classed A1 Det Norske Veritas, has been built for the general trade. There are four large hatchways, with a powerful steam winch at each. The bottom of the vessel is constructed on the cellular principle for water ballast throughout, and is subdivided into various compartments for trimming. The captain, officers, and engineers are accommodated in a large house on the bridge deck amidships, the saloon being handsomely fitted up in polished hardwoods, and the crew are housed in the topgallant forecastle. Every modern appliance has been fitted for the convenience of loading and discharging of cargo. On leaving the ways the vessel was named *Hiso*, the ceremony being performed by Mrs. Pedersen, wife of Captain Pedersen. The vessel is fitted with triple-expansion engines by Messrs. William Allen & Co., Limited, of Sunderland, the cylinders being 19 in., 31 in., and 51 in. diameter, with a stroke of 36 in., the working pressure being 160 lbs. During construction the vessel and engines have been superintended on behalf of the owners by Captain Pedersen, of Staubo, who will take command.

Royal Exchange.—On June 28th Messrs. R. Craggs & Sons launched at Middlesbrough a steamer of the following dimensions:—Length, 302 ft. by 43 ft. beam, by 21 ft. 4½ in. depth. She will be fitted with triple engines, having cylinders 21½ in., 36 in., and 58½ in. in diameter, by 39 in. stroke. Steam will be supplied by extra large boilers, 14¼ ft. in diameter, working at 160 lbs. pressure. She was at once put under Messrs. Sir. C. Furness, Westgarth & Co.'s sheerlegs to receive her machinery. The vessel has been built to the order of Messrs. A. Low, Son & Co., of London, and was named *Royal Exchange*.

Moorgate.—On June 30th Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, launched the s.s. *Moorgate*, built to the order of Messrs. The Dowgate Steamship Co., Limited, of London, of which Mr. H. W. Dillon is the managing owner. She is built on the three deck rules, to Lloyd's highest class, with only one deck laid. Her principal dimensions are:—Length between perpendiculars, 325 ft.; breadth, extreme, 45 ft. 6 in.; depth, moulded, 26 ft. 4 in. She is designed to have a large cubic and deadweight capacity, which will be carried on a moderate draught of water. The propelling machinery is constructed by Messrs. John Dickinson & Sons, Limited, of Sunderland, the sizes of the cylinders being 23 in., 38 in., and 62 in., by 42 in. stroke, supplied with steam from two multitubular boilers at 160 lbs. pressure. The vessel was gracefully christened and launched by hydraulic power by Miss Harland, daughter of Captain Harland, who will take command of the vessel.

Therese.—On Saturday, July 2nd, Sir Raylton Dixon & Co., Limited, launched from their Cleveland Dockyards, Middlesbrough, a steel screw steamer, being the second of two built to the order of Martin Carl, Esq., of Copenhagen. Her dimensions are, 250 ft., by 35 ft. 6 in., by 19 ft. moulded. She is built to Lloyd's requirements, with special arrangement of loading facilities and continuous hatchways for a deadweight capacity of about 2,000 tons on a light draught of water. Triple-expansion engines will be fitted by Messrs. George Clark, Limited, Sunderland, having cylinders 18 in., 29 in., and 48 in., by 33 in. stroke, with one large boiler working at 160 lbs. pressure. The vessel has been constructed under the personal supervision of Captain Knudsen. On leaving the ways she was gracefully named *Therese* by Miss Laura Caspar, of Linthorpe.

Javet.—On July 4th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel screw tug boat, built to the order of Captain F. T. Munkman, of Hull, tug owner, etc. She is intended for general towing purposes. The vessel has been constructed to class 100 A1 at Lloyd's, and has been built under the superintendence of Messrs. Elliot & Watson, of Hull. The dimensions are as follows:—Length between perpendiculars, 85 ft., by 18 ft. moulded beam, by 10 ft. moulded depth. She will be fitted with machinery by Messrs. Cooper & Co., of Hull, the engines being of triple-expansion type, 11 in., 18 in., and 30 in. diameter, by 22 in. stroke, working at a high pressure. The vessel has been fitted with all the latest improvements, with steam windlass, etc., the fore cabin is made of mahogany and pitch pine, neatly upholstered. On leaving the ways the vessel was christened the *Javet* by Miss Amy Armstrong, of Hull.

Fourth of July.—On July 4th the first of three vessels to be launched by Sir W. G. Armstrong, Whitworth & Co. on three successive days, left the ways at the Walker yard on the Tyne. She is a fast protected cruiser of 4,160 tons displacement. Her principal dimensions are:—Length, 360 ft.; breadth, 46 ft. 6 in.; draught, mean, 17 ft.; displacement, 4,160 tons; and armament, two 8-in. quick-firing guns, ten 4·7 in. quick-firing guns, 16 3-pounder quick-firing guns, six 1-pounder quick-firing guns, and five torpedo tubes. Of an estimated speed of 22½ knots, and in many respects similar to the Japanese cruiser *Takasago*, built recently by the same firm, and now on its way to Japan.

Harport.—On July 4th Messrs S. P. Austin & Son, Limited, launched at Sunderland, the steel screw steamer *Harport*, which has been constructed to the order of Messrs. J. & C. Harrison, of London, Newcastle, Cardiff, &c. The ceremony of naming the vessel was performed by Mrs. F. A. Harrison, wife of one of the owners.

Alala.—On July 4th there was launched from the Southwick yard of Messrs. Robert Thompson & Sons a first-class cargo and cattle steamer, built to the order of Messrs. E. F. & W. Roberts, of Liverpool. Length between perpendiculars, 340 ft.; breadth, 45 ft., and depth, moulded, 25 ft. 9 in. She will carry a large cargo on about 21 ft. draught, and is constructed with extra strength to obtain Lloyd's minimum freeboard for "three deck" vessels. There is a cellular bottom and peaks for water ballast and divided longitudinally for trimming purposes. Poop and bridge amidships can be used for cargo if required. There are five large hatchways with powerful winches and double derricks for rapid loading and discharging, the accommodation being placed amidships on top of bridge for captain, officers, and engineers, the saloon, &c., being tastefully fitted up in different shades of solid oak. In the topgallant forecastle are large and spacious rooms for petty officers and crew, the vessel being in every respect fitted with all modern improvements for a first-class cargo and cattle steamer. The engines, having cylinders 24 in., 39 in., and 65 in., with 42 in. stroke, and extra large boilers of 180 lbs. pressure, are by Messrs. the North-Eastern Marine Engineering Co., Limited, Sunderland. During construction the machinery and vessel have been personally superintended by Messrs. Irwin Atkinson & Young, of Liverpool, and Captain Matthias. As the vessel left the ways she was gracefully christened *Alala* by Mrs. Joseph Thompson.

Jeneral Baquedano.—On July 5th there was launched from the Elswick shipbuilding yard of Sir W. G. Armstrong, Whitworth & Co., Limited, a training ship built to the order of the Chilian Government. The vessel is comparatively speaking not a large one. Of a displacement of 2,500 tons, she is specially adapted for training purposes, and though ostensibly a barque-rigged sailing vessel, she will have armaments and auxiliary steam power so as to instruct her future seamen in all branches of their profession. The vessel was named the *Jeneral Baquedano* by Madame Bascunan, the wife of the Secretary of the Chilian Legation in London.

H.M.S. Amphitrite.—On July 5th the first-class protected cruiser *Amphitrite* was launched from Messrs. Vickers, Sons, & Maxim's Naval Construction Works, at Barrow. Mrs. Vickers, wife of the chairman of the firm, performed the christening ceremony. The *Amphitrite* is of the *Argonaut* class, and is 435 ft. between perpendiculars, but the overhanging stern and projecting ram make the length over all 463 ft. The breadth over sheathing is 69 ft., and her moulded depth to the upper deck 39 ft. 9 in. The mean load draught of the vessel is 25 ft. 3 in., at which draught the displacement is 11 000 tons.

The hull is constructed of Siemens-Martin steel, the heavy external framing of the bow and stern, as well as propeller brackets and the rudder frame, being of phosphor-bronze castings. The double bottom is minutely subdivided into watertight compartments. The protection consists of an armoured deck of steel plating, 4 in. thick at the crown, which extends the whole length of the vessel. The coal bunkers have a capacity of over 2,000 tons. The *Amphitrite* is supplied with two under-water broadside torpedo tubes. There are in all 41 guns, and in one minute these will be capable of discharging 6,898 shots, varying in weight from 100 lb. downwards and totalling about 7½ tons, while during the same period 3,854 lbs. of powder will be used. The propelling machinery consists of two sets of vertical direct-acting triple-expansion engines, each set having four cylinders working on separate cranks, the diameter of the cylinders being—high-pressure 34 in. intermediate 55½ in., and the two low-pressure 64 in. The collective I.H.P. is expected to be 18,000 when running at about 120 revolutions per minute with a steam pressure of 250 lbs. The boilers are of the latest Belleville type, fitted with economisers, there being 30 boilers. The total heating surface in the boilers and economisers is about 47,300 square feet, the grate surface being 1,390 square feet. The working steam pressure will be 300 lbs. to the square inch, reduced to 250 lbs. at the engines. She will steam 21 knots without resorting to forced draught.

Tokiwa.—On July 6th there was launched at the Elswick yard of Sir W. G. Armstrong, Whitworth & Co., Limited, a first-class armoured cruiser built for the Imperial Japanese Navy. Her principal dimensions are:—Length, 480 ft.; breadth 67 ft.; draught, mean, 24 ft. 4 in.; displacement in tons, 9,700. The armament consists of four 8-in. breech-loading guns, 14 6-in. quick-firing guns, 12 12-pounder quick-firing guns, seven 2½-pounder quick-firing guns, and five torpedo tubes; armour—complete belt 7 in. to 3½ in., citadel 5 in., casemates 6 in., barbettes 6 in., conning tower 14 in. Her speed is 21½ knots with 18,000 I.H.P. forced draught, 20 knots with 13,000 I.H.P.; open stokeholds; coal supply, normal, 600 tons; full, 1,200 tons.

Majestic.—On July 6th Messrs. Cleland's Graving Dock and Slipway Co., Limited, launched at Willington Quay, the screw tug *Majestic*, which has been built to the order of the Grimsby Deep Sea Towing and Salvage Co., Limited. The dimensions of the vessel, which has been specially designed for towing and salvage purposes, and has been constructed under Lloyd's and Board of Trade inspection, are:—Length, 106 ft.; breadth, 22 ft.; depth, 11 ft. She is being engined by Messrs. Tweedy Brothers, North Shields.

Severn.—On Wednesday, July 6th, Sir Raylton Dixon & Co., Limited, launched from their Cleveland Dockyards, Middlesbrough, a large mail and passenger steamer, built to the order of the Royal Mail Steam Packet Co., of London. To suit the requirements of the trade which the vessel will be engaged in between this country, Portugal and South America, many special designs have been introduced in her construction. She is built to Lloyd's highest requirements under special survey, three deck rule, and to the Board of Trade regulations for carrying passengers. Her principal dimensions are:—364 ft. by 45 ft. 2 in. by 28 ft. 1 in., with a gross tonnage of about 4,000 tons, and a deadweight carrying capacity of about 3,000 tons on a light draught of water. The accommodation for first-class passengers under poop, aft, will be handsomely fitted up and provided with every modern convenience. The main deck forward and upper deck aft will be fitted up complete for the accommodation of 700 third-class passengers or for carrying troops, and lighted throughout with a splendid installation of electric incandescent lights. A cold chamber will also be arranged and fitted with a powerful refrigerating machine to meet the company's requirements. Four powerful steam winches, of a design and construction specially prepared for this steamer, will be supplied, also two steam cranes capable of lifting heavy weights. The vessel will be fitted with engines of the triple-expansion type, constructed by Messrs. Thos. Richardson & Sons, Limited, Hartlepool, having cylinders 28 in., 46 in., 77 in. by 48 in. stroke, supplied with steam by four single-ended boilers, 13 ft. 6 in. by 11 ft. 6 in., fitted with Howden's forced draught, and one auxiliary boiler, 10 ft. 7 in. by 10 ft., working at 180 lbs. pressure, which it is expected will drive the steamer 13 knots an hour. The vessel has been built under the supervision of Captain Hicks and Mr. Arthur, the chief resident inspector being Mr. Westland. On leaving the ways she was gracefully named the *Severn* by Mrs. Hicks, wife of Captain Hicks, of Southampton, the Marine Superintendent of the company.

Hongkong Maru.—On July 7th this very fine twin-screw liner was successfully launched from the yard of Sir James Laing, Sunderland. The vessel has been built to the order of the Oriental Steamship Co., of Japan (Tayo Kisen Kamshiki Kisha, of Tokio), and is the second ship built by Sir James Laing for that company, and is intended for fast passenger and cargo service between China, Japan and the United States. Her dimensions are:—Length, 431 ft.; breadth, 50 ft. 6 in.; depth, moulded to upper deck, 32 ft. 6 in. The vessel has been constructed of steel throughout under the supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, to Lloyd's highest class, as well as to the rules of the Imperial Japanese Government and the British Board of Trade. Accommodation has been provided for a large number of first-class passengers, second-class passengers, and about 250 emigrants. The first-class accommodation has been designed and carried out in the most modern and handsome manner, and consists of special suites, a luxurious saloon capable of seating all the first-class passengers at one time, spacious social hall, and tastefully decorated ladies' rooms. The second-class passengers are accommodated in a similar manner. Electric light has been fitted throughout, and ample and efficient ventilation is arranged for, as well as a complete system of heating during the cold weather. There is space in the holds for about 5,000 tons of cargo, and suitable winches and deck gear are provided to handle this cargo with every speed. Vessel is also fitted with mail and sick rooms. The engines, which are built by Messrs. Geo. Clark, Limited, of Sunderland, have been designed with a view to the high speed on service of nearly 17 knots per hour, and are of the following dimensions—28¼ in., 46 in., and 72 in. cylinders, with a stroke of 48 in., taking steam from four double-ended and one single-ended boilers. The engines are in duplicate, and there is also a powerful auxiliary boiler, and a very complete installation of machinery for freezing, electric light, steering gear, and other purposes.

Alert.—On July 8th there was launched from the Woolston shipbuilding yard of Messrs. J. G. Fay & Co., the handsomely modelled twin-screw tug and passenger steamer *Alert*, built to the order of the Poole and Swanage Towing and Passenger Steamer Co., Limited. The vessel, which is 120 ft. long by 20 ft. by 11 ft., is built throughout of Siemen's-Martin mild steel, and is classed in Lloyd's Register. She possesses all modern equipments of an up-to-date vessel of this description including steam windlass, steam steering gear, &c. Accommodation is provided for first and second-class passengers in spacious dining saloons and ladies' cabins, &c., below; while above, the vessel has a promenade deck extending over half her length. Twin-screw engines have been fitted of sufficient power to maintain a high rate of speed. After the vessel was successfully launched she then proceeded alongside the company's wharf to have her machinery shipped.

Richmond Castle.—On July 8th Messrs. Pickersgill & Sons launched at Southwick a steel screw cargo steamer of the spar-deck type, built to the order of Messrs. Jas. Chambers & Co., of Liverpool. The dimensions of the vessel are as follows:—Length, 360 ft.; breadth, 46 ft. 3 in.; depth, 28 ft. 2 in.; and she has been built under Lloyd's special survey for the 100 A1 class. She will carry a deadweight cargo of about 5,900 tons. The engines and boilers are to be fitted by Messrs. Geo. Clark, Limited, the engines being of the triple-expansion type, having cylinders 23½ in., 40 in., and 66 in., and a stroke of 45 in. The vessel was named *Richmond Castle*.

Taboga.—On Monday, July 18th, Messrs. Wigham Richardson & Co. launched from their Neptune shipyard a very smart screw steamer, which they are building for the Pacific Steam Navigation Co., Liverpool, for service on the West Coast of South America. The vessel is of steel, 185 ft. long by 31 ft. beam; she will be rigged as a two-masted schooner, and will have very well-finished accommodation for 22 first-class passengers in 11 state-rooms, all in deck-houses on the promenade deck, special attention being paid to the arrangements for securing the comfort of the passengers. Arrangements are also made on the main deck for carrying a large number of cattle. The steamer will be propelled by a set of compound engines, which, with the boilers, are also being constructed by Messrs. Wigham Richardson & Co. As the vessel left the ways she was named the *Taboga*, the christening ceremony being gracefully performed by Miss Dorothy Tweedy, daughter of Mr. John Tweedy, of the builders' firm.

L. H. Carl.—On Tuesday, July 19th, Messrs. Wm. Gray & Co., Limited, launched a fine steel screw steamer of the following dimensions, viz.:—Length over all, 280 ft.; breadth, 40 ft.; depth, 20 ft. 6 in. She has been built to the order of Mr. L. H. Carl, of Copenhagen, and will take Lloyd's highest class. The deck erections consist of poop, bridge, and forecastle. A handsome saloon, state-room, and captain's accommodation will be fitted up in the poop, and comfortable quarters for the engineers and officers amidships, and for the crew forward. The hull is built with deep frames and cellular double-bottom and ballast tank in the after-peak; four steam winches placed on platforms formed on continuous hatch coamings, from poop to bridge and bridge to forecastle, patent donkey-boiler, steam steering-gear placed in engine-room casing, hand-screw steering-gear aft, direct steam windlass, schooner rig, boats on beams overhead, grain divisions, and all improved appliances for working the steamer will be provided. The engines are of the triple-expansion type, working on three cranks, and are from the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, the cylinders being 21 in., 33 in., and 56 in. diameter, with 36 in. piston stroke, and 2 large steel boilers to work at a pressure of 160 lbs. per square inch. The ceremony of naming the steamer *L. H. Carl* was gracefully performed by Miss Sylvia Carl, of Copenhagen, daughter of Adolf Carl, Esq., managing owner.

Prince Arthur.—On July 19th s.s. *Prince Arthur* was successfully launched from Messrs. Earle's Shipbuilding and Engineering Co., Limited, at Hull. This is the second mail and passenger steamer built by Messrs. Earle's company this year to the order of the Dominion Atlantic Railway Co., of Canada, and like her sister, the *Prince George*, has been constructed under the supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, to the highest class at Lloyd's and in conformity with the British Board of Trade and the United States regulations. Her dimensions are as follows:—Length, 280 ft.; breadth, 38 ft.; depth, moulded, 17 ft. 3 in., the hull being of steel, and having some considerable additions to scantlings in comparison with those required by the rules. First-class passenger accommodation is provided for 340 persons and 44 second-class passengers can also be carried. Amidships a spacious dining saloon has been arranged capable of holding 100 passengers, and this apartment, together with the saloon entrance, music saloon, smoke-room, state cabins, and ladies' saloon, has been designed and carried out in a most handsome and luxurious style. The second-class passengers are housed in the forward 'tween decks. The general arrangements for lighting, heating, and ventilation, have been designed on the most modern principles by means of a duplicated electric installation. Ample provision has been made for the carriage of cargo, and the deck machinery for dealing with this is of a powerful and complete description; being designed for the fast speed of 19 knots on service, most ample engines and machinery having been fitted. The engines are of the triple-expansion four-cylinder, twin-screw type on the Yarrow-Schlick balanced principle, this having the effect of reducing vibration so often noticeable in vessels of high speed. The dimensions of the cylinders are 26 in., 40 in., 45 in., and 45 in., with a stroke of 30 in., and steam is supplied by four large single-ended boilers, worked under forced draught by electrically driven fans. There are also bronze propellers, each propeller being driven by a separate pair of engines. Special attention has been paid not only to the convenience, but also to the important matter of safety, there being a full outfit of boats, life-saving and fire appliances, also an automatic fog signal and powerful search-light for use at night or in thick weather.

Volscian.—On Wednesday, July 20th, there was launched from the yard of Messrs. R. Williamson & Son a finely-modelled screw steamer, built to the highest class at Lloyd's for Messrs. Rogers & Bright, Liverpool. Her dimensions are:—Length over all, 185 ft.; length between perpendiculars, 178 ft.; breadth, 27 ft. 8 in.; depth, moulded, 13 ft. 4 in.; and designed to carry 750 tons on Lloyd's freeboard. The engines are to be supplied by Ross & Duncan, of Govan, and are of the triple-expansion type, having cylinders 15½ in., 25½ in., and 41 in., with a stroke of 30 in. As she left the ways she was gracefully named *Volscian* by Mrs. E. Cook.

Ceres.—On July 20th there was launched the steel screw steamer *Ceres*, built by Messrs. Wm. Gray & Co., Limited, for Messrs. Schmidt & Hansen, of Flensburg, through Messrs. E. A. Casper & Co., of West Hartlepool. The steamer is intended for the timber and general cargo trades, and takes Lloyd's highest class, and her dimensions are:—Length over all, 280 ft.; breadth, 39 ft.; depth, 18 ft. 2 in. She has a half-poop, raised quarter deck, and partial awning deck, with houses on deck for cabins. The hull is built with deep framing and cellular double-bottom, and the equipment will be of the most improved description, including steam windlass, steam steering gear, four steam winches, &c. She will have triple-expansion engines made at the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, having cylinders 19 in., 30½ in., and 51 in., with a piston stroke of 36 in., and two steel boilers to work at a pressure of 160 lbs. per square inch. The ceremony of naming the ship *Ceres* was gracefully performed by Miss Mattocks, of Harringay, London.

Tug Boat.—On July 21st Messrs. Day, Summers & Co., of Northam Iron Works, Southampton, launched a twin-screw tug boat, which has been built to the order of the Union Steamship Co., for service on the coast of South Africa. The vessel's dimensions are:—Length, 100 ft.; breadth, 21 ft.; depth, 9 ft. 6 in.; the engines are of the compound surface condensing type; the cylinders are 12 in. and 22 in. diameter, the stroke being 21 in.; the boiler is 11 ft. 3 in. diameter by 10 ft. long, and is constructed to work at 110 lbs. pressure.

Sir W. T. Lewis—On Thursday afternoon, July 21st, Messrs. Richardson, Duck & Co., launched from their yard a steel screw steamer of the following dimensions:—Length over all, 351 ft.; breadth, extreme, 46 ft.; depth, moulded, 27 ft. 3 in.; tonnage gross, about 3,520 tons. This vessel, which has been built to the order of W. J. Tatem, Esq., of Cardiff, will class 100 A1 at Lloyd's Register, and has been built under special survey. She is of the three-deck type, one deck laid, with poop, bridge, and topgallant forecastle. Accommodation for captain and passengers is provided in poop, officers and engineers being berthed in iron houses on bridge deck, and crew in topgallant forecastle. A cellular double bottom and fore-and-aft peak tanks are fitted for water ballast, and equipment includes five steam winches, large horizontal donkey boiler, steam windlass, stockless anchors, steam steering gear, &c. The engines, by Messrs. Blair & Co., have cylinders 24 in., 40 in., and 66 in., by 45 in. stroke, steam being supplied by two single-ended boilers, having a working pressure of 160 lbs. As the vessel was leaving the ways she was gracefully christened *Sir W. T. Lewis* by Mrs. William Cook, of Blackheath, London.

Mancunia.—On Thursday, July 21st, Messrs. William Gray & Co., Limited, West Hartlepool, launched the fine steel screw steamer *Mancunia*, which they have built to the order of Messrs. Sivewright, Bacon & Co., of West Hartlepool and Manchester, for the Manchester and Salford Steamship Co., Limited. This makes the third launch from Messrs. Gray's yard this week. The building of the *Mancunia* has created considerable interest in shipping circles, because of the side ballast tanks with which she is fitted to facilitate her voyaging in ballast. It is difficult with the ordinary systems of construction to get sufficient capacity for water ballast without either unduly curtailing the cargo space or hampering the storage of cargo. In vessels which were deep in proportion to their breadth, ballast was required in the bottom only. The steamers of to-day, however, not only require more ballast, but it acts best when placed higher in the vessel, and it has become usual before sending them on a voyage without cargo to put some hundreds of tons of rubbish ballast on board, all or part of it being placed on deck. This makes them more manageable and improves their speed, but it is obviously not a satisfactory method, being costly and inconvenient. In the *Mancunia* the side tanks provide a ready means of efficient ballasting, completely under control. They can be filled or emptied without hindering the loading or discharging of cargo, and so avoid the loss of time which frequently occurs by present methods. The *Mancunia* will take Lloyd's highest class. Her length over all is 362 ft., breadth, 51 ft.; depth, 27 ft.; and carrying capacity, 6,200 tons. She will have four masts, cutwater bow and short bowsprit, and large poop, bridges, and forecastle decks. The cabins will be in houses on the bridge, and the seamen's and firemen's room forward. There is considerable area on deck for carrying cattle or timber, &c., and the arrangements throughout the ship, including a special outfit of steam winches, derricks, &c., will enable cargo to be dealt with most expeditiously. The cellular double bottom extends throughout the ship, and with the after peak tank will contain 1,000 tons of water ballast, while the side tanks will hold 700 tons more, a total of 1,700 tons. This should immerse the vessel sufficiently to enable the propeller and rudder to do their work properly, and have the effect of reducing the risk of the machinery being strained by the propeller "racing" in heavy weather. The bottom of the fore part of the ship also will be less liable to be shaken loose, because of the extra immersion, in the Atlantic trade. The side tanks extend through the main and after holds and engine room for a length of 191 ft., and, to this extent, the ship has double sides, which add greatly to her strength and, as will at once be seen, to her safety also, as in many instances damage of an extent sufficient to sink ships in a short time would not extend through the inner side. These advantages are secured without extra material being required in the construction of the side tanks, lower decks and other parts used in strengthening ordinary ships, and which greatly impede stowage, being dispensed with, and the material applied in building the side tanks. Hence the new type loses nothing as a cargo carrier. The machinery consists of a fine set of triple-expansion engines of over 1,400 H.P., with three main boilers to work at a pressure of 170 lb. per square inch, all from the Central Marine Works of the builders. The plans of the *Mancunia* have been arranged under the personal supervision of Captain Bacon, who has also superintended the building of the ship with Mr. James Robinson, and the patent side tanks are the invention of Mr. Archibald McGlashan, chief draughtsman to the builders. A large company witnessed the launch, and the christening ceremony was gracefully performed by Mrs. Harold Agnew, of Harfield Hall, Alderley Edge. Amongst those present were Captain and Mrs. W. C. Bacon, Mr. G. W. and Mrs. Sivewright, Mr. W. and Mrs. Sivewright, Mr. Harold Agnew, Mr. and Mrs. J. T. Furness, Mrs. Salt, Misses E. and I. Pape, Captain and Mrs. Stewart, Mr. Robinson, Superintendent of the Manchester and Salford Steamship Co., Limited, Mr. and Mrs. C. H. Greenwell, W. C. Gray, G. H. Baines, G. Jones, Directors of W. Gray and Co., Mr. Purvis, Assistant Manager, Captain Joe Murrell, and Mr. and Mrs. McGlashan.

Buzzard and Kestrel.—On July 21st, Messrs. Cochrane & Cooper, Ltd., launched from their Grovehill Shipyard, Beverley, two steam trawlers of the following dimensions:—109 ft. by 21 ft. by 11 ft. 3 in. depth of hold, to the order of T. Baskcomb, Esq., Grimsby. Engines of the triple-expansion type are being supplied by Messrs. C. D. Holmes & Co., Hull. The vessels will be complete with all modern appliances for trawling. Mrs. Lottie Baskcomb named the vessels the *Buzzard* and *Kestrel* respectively. After the ceremony the company adjourned to the offices of the builders for luncheon, and the usual toasts were honoured.

Ehrenfels. — On Thursday, July 21st, Messrs. Wigham Richardson & Co. launched from their Neptune Shipyard a large steel screw steamer which they are building for the Eastern service of the Deutsche-Dampfschiffahrts Gesellschaft "Hansa," of Bremen. The steamer, which received the name of *Ehrenfels*, is a similar vessel to the *Hohenfels* and *Tannenfels*, recently built by Messrs, Wigham, Richardson & Co. The steamer will carry 8,000 tons deadweight, and will be built to obtain Lloyd's highest class. Her decks will be of teak, and she will have a limited amount of passenger accommodation. Her engines and boilers will both be constructed by Messrs. Wigham, Richardson & Co., and like the previous vessels, the engines are balanced on the well-known Yarrow, Schlick & Tweedy system, which is now so deservedly popular for the best class of marine engines, whilst the boilers will be fitted with forced draught on Howden's system. The christening ceremony, which was gracefully performed by Miss Raiser, of Worms-am-Rhein, was witnessed by a goodly company.

Polymitis.—On July 22nd Messrs. Wm. Doxford & Sons, Limited, launched from their yard at Pallion the turret deck steamer *Polymitis*. This vessel has been built to the order of Othan A. Stathatos, Esq., of Braila, Roumania. Her principal dimensions are—length, 335ft.; breadth, 46ft.; depth, 26½ft. The engines, also of Messrs. Doxford's make, have cylinders 24½in., 40in., 66in. by 45in. stroke, the boilers being 13ft. by 11ft. 6in., and fitted with Howden's forced draught. The deck machinery consists of 6 steam winches, supplied by John Lynn & Co., windlass by Emerson, Walker, Thompson Bros., capstan by R. Rogers & Co., the steam steering gear being made by John Wigham, and donkey boiler by Riley Bros. The vessel is to be fitted throughout with a complete installation of electric light by the Sunderland Forge Engineering Co., Limited. She is the forty-third of this type now afloat. During construction the *Polymitis* has been under the supervision of Captain Hanos. The christening ceremony was performed by Miss Doxford, Silksworth Hall.

LAUNCHES.—Scotch.

Amethyst.—On June 20th there was launched at St. Monans, by Mr. John Robertson, a fishing-boat, built to the order of Messrs. William Gowans & Philip Smith, St. Monans. The craft, which was named the *Amethyst*, is 65 ft. 4 in. extreme length, with a breadth of beam 19 ft. 8 in.

Enero.—On June 23rd the Campbeltown Shipbuilding Co. launched from their yard at Trench Point the second of two steel screw steamers purchased by a Spanish firm of shipowners. The vessel, which has been built to the highest class at Lloyd's, is of 3,400 tons burthen, and is intended for general trading. Triple-expansion engines will be supplied at Glasgow. The christening ceremony was performed by Miss Mackay, Greystone, who named the steamer *Enero*.

Oron.—On June 23rd there was launched by Messrs. Barclay, Curle & Co., Limited, at Whiteinch, on the Clyde, the screw-steamer *Oron*, built for the British and African Steam Navigation Co., Limited, to trade between Liverpool and West African ports. The vessel has been built under Lloyd's special survey, and will be classed 100 A1 under the three-deck rule, having extra stiffening above rule requirements. The vessel is fitted with handsome and commodious accommodation for both first and second-class passengers, special attention having been given to the ventilation so necessary in hot climates. A new departure has been made in the saloon accommodation, the vessel having her dining saloon on the promenade deck and over the cabins. Her dimensions are, 345 ft. by 42 ft. by 25 ft. 8 in., with a gross tonnage of about 3,220 tons, and carries a large deadweight on a light draught. The naming ceremony was performed by Mrs. Alexander Elder, of Fernholm, Southport, wife of the chairman of the company. After the launch the vessel was towed to the crane to be fitted with her machinery, which has been constructed by the builders. The engines are of the triple-expansion type, steam being supplied from two large single-ended boilers at 180 lbs. pressure, capable of driving the vessel a speed of about 12 knots on service. She is fitted with all the latest improved auxiliary machinery, including electric light, steam cranes, winches, &c.

Balder.—On June 23rd Messrs. Blackwood & Gordon launched from their shipbuilding yard, Port-Glasgow, a steel screw-steamer for the Thule Steamship Co., of Gothenburg. She is of the following dimensions:—Length, 246 ft.; breadth, 34 ft.; depth, 16 ft. 6 in., moulded; is fitted with long poop, bridge, and forecastle; and has accommodation for 52 first-class passengers, 30 second-class, and 12 third-class. On leaving the ways she was named *Balder* by Miss M'Geoch, of Paisley, niece of one of the builders. Triple-expansion engines will be supplied by the builders. The vessel is intended for the company's passenger and general goods trade between Gothenburg and this country.

Clyde.—On June 24th there was launched at Glasgow a steam steel yawl of about 170 tons gross, named the *Clyde*. She is registered at Hull.

Andeni.—On June 24th Messrs. William Hamilton & Co. launched from their west yard, Port-Glasgow, a steel screw steamer of about 2,100 tons net register and 3,300 tons gross register, and to carry about 3,400 tons deadweight, for Messrs. Elder, Dempster & Co., Water Street, Liverpool, for their African trade. The vessel has been built to the highest class at Lloyd's, and is of the following dimensions:—Length, b.p., 330 ft.; breadth, 45 ft. 6 in.; depth, moulded, 26 ft. 6 in. All the latest requirements for the quick loading, discharging, and working of the ship have been supplied. The holds are arranged so that shifting boards and feeders in 'tween decks can be easily fitted for carrying grain in bulk. The vessel is to be schooner-rigged, and the topmasts are made to telescope, so that she can pass under the bridges on the Manchester Canal. The accommodation for the officers, crew, and cattlemen is of the most complete description, and fitted with every requisite for their comfort. The machinery, which is being supplied by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system, the cylinders being 24 in., 40 in., and 65 in. diameter by 42 in. stroke, steam being supplied by two large boilers working at 160 lbs. pressure. As the vessel left the ways she was gracefully named the *Andeni* by Mrs. John W. Hamilton, Rossbank, Port-Glasgow.

Beaufort.—On June 25th Messrs. T. B. Seath & Co., shipbuilders, Rutherglen, launched from their yard the s.s. *Beaufort*, 90 ft. by 19 ft. by 11 ft. 1 in. moulded. This vessel has been constructed under special survey to the highest class in Lloyd's register, and is intended for pilot service at Swansea. The machinery, which is compound surface condensing, will be fitted by Messrs. Fisher & Co., Paisley.

Horatius.—On June 27th Messrs. Russell & Co. launched at Port-Glasgow the steel-screw steamer *Horatius* for Messrs. R. P. Houston & Co., Liverpool. This steamer registers 3,525 tons, and will carry 5,800 tons deadweight. The dimensions are:—Length, 340 ft.; breadth, 46 ft.; depth, 28 ft. 6 in. Triple-expansion engines of 24 in., 40 in., and 65 in. by 45 in. stroke, will be supplied by Messrs. Hutson & Son, Glasgow.

Dane.—On June 27th there was launched from the boat-building yard of Messrs. J. & J. Hay, Limited, Kirkintilloch, a steamer for the firm's own coasting traffic. The boat was a little smaller than the last few built, its dimensions being:—Length, 66 ft.; beam, 16 ft. 9 in.; depth, 7 ft. 8 in. On taking the water it was christened *Dane* by Miss Roberta Cowan, Benroy, daughter of Bailie Cowan.

Princess Louise.—On June 29th Messrs. Ritchie, Graham & Milne launched at Whiteinch the *Princess Louise*, a screw passenger steamer of 120 tons, built to the order of Captain Paterson, Oban, for his passenger traffic in connection with the Caledonian Railway Co.

Fedor Enrold.—On July 1st Messrs. Wm. Simons & Co., Limited, Renfrew, launched complete from their yard the *Fedor Enrold*, being the third of four powerful barge-loading dredgers which they have on order for the Russian Government. This vessel has been constructed under the inspection of, and is also classed by Bureau Veritas. Independent steam hoisting gear is provided for manipulating the bucket ladder, and also independent steam winches are fitted at bow and stern of vessel for manœuvring the vessel when at work. Electric light is fitted on deck and throughout the vessel for working day and night. There are separate cabins for the officers and crew, and private cabin on deck is also provided.

Coburg.—On July 2nd Messrs. Gourlay Brothers & Co. Camperdown Shipyard, Dundee, launched a steel screw steamer for Messrs. James Currie & Co., Leith, to be employed in the coasting trade between this country and the Continent. As the vessel left the ways she was christened *Coburg* by Mrs. Allister Currie. The dimensions are:—Length, 225 ft.; breadth, 30 ft.; depth, 16 ft. 6 in.; gross tonnage, 930. The propelling machinery consists of a set of triple-expansion engines.

Vera.—On July 4th the Clydebank Engineering and Shipbuilding Co., Limited, launched the twin-screw steamer *Vera*, built by them to the order of the London & South-Western Railway Co., for their fast passenger and mail service between Southampton and the Channel Islands, and also the coast of France. The launching ceremony was gracefully performed by Mrs. Dixon, the wife of the marine superintendent of the South-Western Railway Co. The principal dimensions of the vessel are:—Length, between perpendiculars, 270 ft.; breadth, 35 ft.; gross tonnage, about 1,140 tons. Accommodation has been provided on the main and lower decks amidships for sleeping 80 first-class passengers in cabins similar to those on ocean-going steamers, while in a deck-house on the promenade deck amidships sleeping accommodation has been arranged for about 80 additional first-class passengers in three separate rooms fitted up on the Pullman car system. Provision has also been made for 50 second-class passengers at the after end of the vessel in large cabins. In order to minimise rolling motion in bad weather, deep bilge keels have been fitted. The machinery will consist of two sets of four cylinder triple-expansion engines designed to attain a high rate of speed. The usual steam steering gear, steam windlass, and steam warping capstan will also be fitted.

Kenmore.—On July 5th Messrs. Charles Connell & Co., launched from their shipbuilding yard at Scotstoun, Whiteinch, a steel screw steamer, built to the order of Messrs. James Gardiner & Co., Glasgow. Her dimensions are:—Length, 354 ft.; breadth, 45 ft.; depth, moulded, 28½ ft.; with a gross tonnage of about 3,800 tons. Engines of the triple-expansion type are being supplied by Messrs. Dunsmuir & Jackson, Govan. As the vessel left the ways she was christened *Kenmore* in the customary manner, by Miss Nellie M'Kenzie, daughter of the company's superintendent.

Truro.—On July 5th there was launched from the shipyard of the Caledon Shipbuilding and Engineering Co., Limited, Dundee, the third of four passenger and cargo steamers ordered by Thomas Wilson, Sons & Co., Limited, Hull. The vessel, which was named the *Truro*, is of the following dimensions:—Length, 234 ft.; breadth, 32 ft.; depth, 14 ft. 5 in.; with a gross tonnage of 836.

Steel Screw Steamer.—On July 7th Messrs. John Fullerton & Co. launched at Merksworth, Paisley, a steel screw steamer of about 300 tons, built to the order of Messrs. Burne, Matthews & Dunn, of Bangor and Newtownards, for their coal carrying trade. Compound engines of 300 I.H.P. will be supplied by Messrs. Campbell & Calderwood, Paisley.

Mainstay.—On Friday, July 8th, Messrs. McMillan & Son launched from their yard at Dumbarton, the s.s. *Mainstay*, which has been built to the order of The Steamship Mainstay Co., Limited, of Liverpool, James J. Mahon, manager. The vessel and her machinery has been constructed under the superintendence of Messrs. Flannery & Tritton, consulting engineers of Liverpool and London. Her dimensions are:—340 ft. by 45 ft. by 28 ft. 9 in., and she is designed to carry a deadweight of 5,600 tons on light draught. There are seven powerful steam winches, large marine-type donkey boiler, and latest appliances for the rapid discharge of cargo; also a large fresh-water condenser. The propelling engines are of the triple-expansion type, having cylinders 24 in., 40 in., and 64 in. by 42 in. stroke, and will be supplied with steam from two large boilers working at a pressure of 180 lbs. per square inch and the latest appliances for economy of fuel will be fitted.

Reval.—On July 18th there was launched from the yard of Ramage & Ferguson, Limited, Leith, a steel screw-steamer built to the order of Messrs. Wm. Thomson & Co., Leith, for their Baltic trade. This new steamer is the second built by Ramage & Ferguson, Limited, for the same owners, and the principal particulars are:—Length, 245 ft.; breadth, 37 ft. 6 in.; depth, moulded, 22 ft. 6 in., the propelling power consisting of a set of triple-expansion engines, with cylinders 19 in., 31 in., 50 in. diameter by 36 in. stroke, steam being supplied from two large single-ended multitubular boilers, working at 175 lbs. pressure. The vessel is fitted with all the most modern improvements, both for working the ship and cargo, including steam steering gear, steam windlass, steam cranes, steam winches, &c. In addition to the foregoing, a complete installation of electric arc lamps for working the cargo has been fitted by Messrs. J. H. Holmes & Co. On leaving the ways the vessel was named *Reval* by Miss Thomson, Rothesay Terrace, Edinburgh, and the builders afterwards entertained a large party to luncheon, when the toasts usual on such occasions were duly honoured.

LAUNCH—GERMAN.

Bielefeld.—On Saturday, July 16th, the Flensburg Shipbuilding Co. launched from their yard a new steel screw steamer of the following dimensions:—Length, between perpendiculars, 404 ft.; breadth, extreme, 47 ft. 8 in.; depth, moulded, 31ft. She is built to Lloyd's 100 A1 class, and is fitted with a cellular double-bottom for water ballast. She has a topgallant forecastle and long poop. The *Bielefeld* is built to the order of the "Deutsch Australische Dampfschiffs Gesellschaft," Hamburg, and is intended for their cotton trade. This is the second of five sister ships which are to be built by the Flensburg Shipbuilding Co., one of which has already been delivered. On leaving the ways she was gracefully christened the *Bielefeld*.

Messrs. The Harrison Engine Co., Limited., have lately completed and delivered a powerful steam steering engine with controlling gear for H.M.S. *Vindictive*, built at Chatham Dockyard, and they have in progress and on order a very large number of their patent direct-acting combined hand and steam steering engines for vessels of 6,000 to 10,000 gross tonnage.

TRIAL TRIPS.

Rapidan.—Lately the fine large steel screw steamer *Rapidan* proceeded on her trial trip in Hartlepool Bay. She has been built by Messrs. Furness, Withy & Co., Limited, Hartlepool, to the order of Sir Christopher Furness, J.P., D.L., West Hartlepool, and is the fourth steamer built by them to run on the Chesapeake and Ohio Steamship Line, between London, Liverpool, and Newport News (United States of America) in the cattle and cargo trade. The vessel is 490 ft. long over all, and her deadweight carrying capacity exceeds 11,500 tons, with a measurement capacity of about 18,000 tons. She is built throughout of Siemen's-Martin steel to Lloyd's 100 A 1 class. The engines, which have been built by the North-Eastern Marine Engineering Co., Limited, Wallsend, together with the independent auxiliary machinery, ran most efficiently, and the vessel attained a speed of over 12 knots.

Princess.—On June 23rd Messrs. Ritchie, Graham & Milne, of Whiteinch, had a very successful trial run on the Clyde with the stern-wheel steamer *Princess*, built for the African Lakes Corporation, Limited, for their passenger service on the Shire River, East Central Africa. The dimensions of the vessel are: 102 ft., by 21 ft., by 3 ft. 3 in., moulded, and the vessel has main, upper, and awning deck; on the main deck there is a large teak house, with accommodation for 12 first-class passengers, and fitted with all the latest improvements for the comfort of passengers in a hot climate. The machinery (supplied by Messrs. Campbell & Calderwood, Paisley) consists of a pair of compound engines of 130 I.H.P., fitted with Morton's ejector, condenser, and Kincaid & Crockatt's feed water filter. The boiler is of the locomotive marine type, of extra large size, and also fitted with forced draught apparatus and the usual appliances. The speed obtained was about 11 miles per hour.

Algleba.—On June 25th the new steel screw steamer *Algleba*, ran her trial trip in the Flensburg Bay. She is built by the Flensburg Shipbuilding Co., to the order of Messrs. Holm & Molzen in Flensburg. The dimensions are: 281 ft. 6 in. by 39 ft. by 18 ft. 11½ in. She is a well-deck boat, and intended for the Baltic and Atlantic trade. The engines of 700 H.P. also built by the Flensburg Shipbuilding Co., gave the vessel an average speed of 10½ knots.

Bellerby.—On June 27th the new steamer *Bellerby*, built by Messrs. Ropner & Son, Stockton-on-Tees, to the order of Messrs. R. Ropner & Co., West Hartlepool, made her official trial trip in the Tees Bay, which was satisfactory to both owners and builders. This steamer has been built under the trunk patent, and has full poop, bridge, and t.g.f. She will carry about 4,600 tons on Lloyd's summer freeboard, and is fitted with triple-expansion engines by Messrs. Blair & Co. After a successful run, the vessel made for the Tyne to load for Genoa.

Kelvindale.—On June 28th this new steamer, which was recently launched from the yard of Messrs. Short Brothers, Sunderland, and built to the order of the Glasgow Steam Shipping Co., went out on trial, and after adjusting compasses was run over the measured mile. After a series of runs a mean speed of 12 knots was attained, which was considered very satisfactory, steam being easily maintained at a pressure of 180 lbs. This vessel has been constructed in excess of Lloyd's requirements for the highest class, and is of the following dimensions:—Length, 334 ft.; breadth, 45 ft.; and depth, moulded, 26 ft. 9 in., with poop and large house on bridge deck, fitted up in polished hardwoods for the accommodation of captain, officers, &c. There is an open bridge amidships, with engineers' accommodation on top. The charthouse is on the flying bridge. The steering engine is placed on the engine-room platform with controlling gear from the flying bridge. The poop is fitted up in commodious apartments for petty officers and crew. The double bottom throughout is constructed on the cellular system principle, divided into trimming compartments for water ballast. A large multitubular boiler is provided for supplying steam to six powerful steam winches for working cargo. In order to leave the holds clear for cargo, deep framing and side girders have been substituted for beams and web frames. The engines have been supplied and fitted by Messrs. W. Allan & Co., Limited, of Sunderland, and work at a pressure of 180 lbs., the boilers being fitted with forced draught.

Mapourika.—On June 29th the s.s. *Mapourika*, built by Messrs. Wm. Denny & Bros., Dumbarton, for the Union Steamship Co., New Zealand, completed her trials. This vessel is 220 ft. long by 33 ft. broad, and 16 ft. 6 in. deep Constructed of steel to scantlings approved by the British Corporation of Shipping, B.S. class. She has a straight stem and elliptical stern, a promenade deck, and topgallant forecastle; also bridge and boat decks, which form shelters and promenades. She is rigged as a two-masted schooner, has a double bottom for water ballast, and the usual watertight bulkheads. She has three cargo hatches with steam winches, and double derricks, the after winch arranged with extended ends for warping the ship and raising the small boats. The small boats are arranged to sit on Captain Cameron's patent skids, which by one instantaneous action releases the boat and leaves it suspended in the davits. This gear is considered by all experts who have seen it to be the most efficient gear yet invented. On the forecastle deck is a steam capstan windlass, and in the after-house a steam-steering gear. A small refrigerator by the Linde Co. is also fitted on board to keep the provisions from deteriorating in the warm climate she trades in. While carrying a large deadweight, she also has accommodation for about 150 first-class passengers, and 34 second class. The officers and engineers are arranged in bridge side-houses, each man having a separate cabin. The captain has a large cabin on bridge deck, with chart-room opening from same. The navigating bridge is above this house, on which is placed the steering standard, Lord Kelvin compasses, telegraph, &c. The seamen and firemen are berthed in separate apartments forward of second-class accommodation. The dining saloon is situated amidships, and is the full breadth of the ship, tastefully finished in sycamore and satinwood, relieved with pilasters and frieze of cameo wood. The side cushions are upholstered in a blue shade of Utrecht velvet, contrasting well with the light shades of wood work. The tables are arranged at the sides, so that small parties may be seated together. The staircase opens direct into saloon at aft end, this, with an open well from the social hall above, giving splendid light and ventilation. Above this saloon is a social hall, finished in similar manner to saloon. In after deck-house is a commodious smoking-room. The whole ship is brilliantly lighted by electric light, including mast and sidelights, and has also electric fan ventilators in passenger accommodation. The vessel has a Board of Trade passenger certificate.

Juno.—On June 29th the steel screw steamer *Juno*, built by Messrs Robert Duncan & Co., Limited, and engined by Messrs Dunsmuir & Jackson, Govan, went down the Clyde on her trial trip. The vessel is 260 ft. by 37 ft. by 20 ft. 6 in. moulded depth, of the single-deck type, with poop, large bridge, and forecastle, carries about 2,750 tons deadweight, and has a capacity for 125,000 cubic ft. of measurement cargo. The arrangements of holds, hatches and decks are particularly suitable for the Baltic and Mediterranean trades, the steamer being fitted with all modern appliances for the rapid loading and discharging of cargo. The engines are of the triple-expansion type, having cylinders 19 in., 30½ in., and 50 in. by 36 in. stroke, and large boiler for 160 lbs. working pressure; also donkey boiler for supply of steam to four steam winches. On the measured mile a speed of 10·2 knots was obtained, which was considered highly satisfactory. The *Juno* is a sister ship to the s.s. *Spartan Chief*, launched this year by the same builders, and sold lately to the Argo Steamship Co, of Bremen, and renamed *Nyland*.

New England.—On June 30th the *New England*, the latest addition to the Dominion Line, left Belfast for adjustment of compasses and trial trip. The *New England* has been built by Messrs. Harland & Wolff, of Belfast, and is expected to be one of the fastest liners between Liverpool and Boston. She is upwards of 565 ft. long, and her gross register is nearly 12,000 tons. The ship is propelled by twin-screws, and triple-expansion engines on the builders' balanced four-cylinder system. The first and second class accommodation, which is arranged on the four principal decks for over 500 passengers, is described as being "second to nothing afloat." The poop has been entirely set apart for the third-class passengers, and can accommodate nearly 800. There is a dining-room 80 ft. in length and about 18 ft. wide. The steerage passengers in this ship have also the benefit of a large and commodious smoking-room, which they are able to enter from the dining-hall by a stairway; and the owners have further furnished a piano for the use of the steerage passengers. The ship is in charge of Captain M'Auley, the Commodore of the Line, who lately commanded the *Canada*, belonging to the same owners.

Cathay.—On June 30th the trial trip took place of the large and powerful steel-screw steamer *Cathay*, of 6,000 tons deadweight carrying capacity, built by Messrs. Ramage & Ferguson Limited, Leith, to the order of the East Asiatic Steamship Co. Ltd., Copenhagen, for their trade between the Baltic and continental ports, with Siam, China, and the Far East. The vessel developed a speed of 12⅝ knots (considerably over the guaranteed speed), and sailed same evening for Antwerp *via* Copenhagen, with a fashionable and representative company on board.

Elna.—On Monday, July 4th, the fine steel screw steamer *Elna*, built by Sir Raylton Dixon & Co., Limited, Cleveland Dockyards, Middlesbro', to the order of Mr. Martin Carl of Copenhagen, was taken out to sea for her official trials under the command of Captain J. Moller. Her principal dimensions are 250 ft. by 35 ft. 6 in. by 19 ft. moulded. She is built to Lloyd's highest class, single deck rule, having poop, bridge, and forecastle, and a deadweight capacity of about 2,000 tons on a light draught of water. Triple-expansion engines have been fitted by Messrs. Geo. Clark, Limited, of Sunderland, having cylinders 18 in., 29 in. and 48 in., by 33 in. stroke, with one large boiler working at 160 lbs. pressure. The vessel has been constructed under the personal supervision of Captain Knudsen, and is a sister vessel to the *Therese*, which was launched by Sir Raylton Dixon & Co. Limited, on July 2nd. After the trials, which passed off most satisfactorily, the vessel proceeded to Blyth to load for Copenhagen.

King Gruffydd.—On July 5th the new steamer *King Gruffydd*, which was built for the King Line, Limited, by Messrs. Russell & Co., Port-Glasgow, went on her trial trip down the Firth of Clyde. The vessel is a fine specimen of the modern cargo steamer, and is 335 ft. in length, 48½ ft. in breadth, and 24 ft. depth, moulded, while her capacity is of 5,200 tons on the exceptionally light draught of 20 ft., thus making her one of the lightest draught steamers of her size. She has six large cargo hatches, and 12 derricks for the expeditious handling of cargo, and besides, has all the latest improvements for economical working. The triple-expansion engines, which were built by Messrs. Kincaid & Co., Greenock, have cylinders 24 in., 40 in., and 62 in. by 42 in. stroke, and exceptionally large boilers working very smoothly. It may be mentioned that a new principle has been adopted in connection with the fitting of the shaft. The tail shaft has been covered with brass to obviate the corrosion which, as a rule, proves so disastrous to steel shafts. This is the invention of Mr. Cumming, the superintendent of the King Line. The steamer proceeded down the firth to Skelmorlie, where the measured mile was run over. Four attempts were made, and the mean speed attained was 11 knots an hour, which was considered most satisfactory.

Juno.—On July 5th the new paddle-steamer *Juno*, which has been built by the Clydebank Engineering & Shipbuilding Co., Limited, for the Glasgow & South-Western Railway Co., ran her official trials on the Firth of Clyde. The vessel was run several times over the measured mile at Skelmorlie, and a mean speed of 19·26 knots per hour was obtained. Afterwards she proceeded down the Firth on a four hours' run at the contract speed. The engines worked admirably, the steam pressure was easily maintained, and the representatives of owners and builders expressed themselves as thoroughly satisfied with the results of the trials. The new steamer, which is intended to take up the excursion service on the Ayr, Troon, and southern section of the Firth of Clyde, is of 600 tons gross, 245 ft. in length, between perpendiculars, and 29 ft. in breadth, moulded. There is accommodation on board for about 1,500 passengers of all classes. The first class are accommodated in the after end of the vessel, their dining-room being seated for 100 persons. In the forward end are spacious apartments for the second class. The promenade deck extends practically the full length of the steamer, and affords fine accommodation for excursion parties. The vessel is thoroughly equipped in accordance with all the Board of Trade requirements. She has steam steering gear, steam warping capstan aft, steam windlass and warping capstan forward, and is lighted throughout with electricity. The engines are of the compound diagonal direct-acting type, on the usual Clydebank design. The boiler pressure, and consequently the ratios of the cylinders, are greater than in any other form of engine. The diameter of the high-pressure cylinder is 33 in. and that of the low pressure 71 in., with a stroke of 60 in. The condenser is built up of steel plates and the entablatures and frames of cast steel, which ensures the maximum of lightness with rigidity. Steam is supplied by one large double-ended boiler of the usual marine type, designed to work at a pressure of 150 lbs. per square inch, with eight furnaces. The forced draught is on the closed stokehold principle, the air being supplied by two double-breasted fans of the builders' own make.

Umta.—On Wednesday, July 6th, the British India Steam Navigation Co.'s new steamer *Umta*, built and engined by Messrs. Alex. Stephen & Sons, Linthouse, went down the river on her trial trip. The *Umta* is a sister ship to the *Uganda*, recently built by Messrs. Stephen for the same owners. The vessel is classed 100 A1 3-deck class, at Lloyd's, has a Board of Trade passenger certificate, large carrying capacity, and is fitted up throughout in a high-class manner. All modern appliances for safety, comfort and efficiency are provided, such as electric light in cabins and holds, steam steering gear, docking telegraph, 10 powerful steam winches, &c., &c. The machinery consists of a set of triple-expansion engines, having cylinders 26½ in., 42 in., and 66½ in. by 51-in. stroke, having two large boilers working under Howden's system of forced draught. The auxiliary machinery consists of 3 Weir's pumps and heater, feed filter, sanitary pump, Weir's evaporator and duplex ballast pump. The shafting is of steel, and propeller blades of Parson's manganese bronze. The machinery on trial gave the utmost satisfaction, and the vessel attained a speed of 12½ knots. There were present Messrs. A. E. & F. J. Stephen, representing the builders, and Captain Hodgkinson, Mr. Clark and Mr. Barr, representing the owners.

Braemar Castle.—On July 8th the steamer *Braemar Castle*, which Messrs. Barclay, Curle & Co., Whiteinch, launched in February last for the Castle Mail Packets Co., Limited, ran her official trials on the Firth of Clyde. The new steamer is of the intermediate class, 470 ft. in length over all, 52¼ ft. in extreme breadth, 33½ ft. in moulded depth, and of 6,300 tons gross. She has accommodation for 70 first-class, 130 second-class, and 150 third-class passengers. The first class are berthed forward of the machinery space on the upper and bridge decks, the second class amidships on the main and upper decks, and the third class aft in the 'tween decks and poop. All the cabins are exceptionally commodious, most of the state rooms being fitted for two persons. The first-class saloon is a spacious apartment panelled in selected oak. The second-class saloon and smoke-room are finished in hardwood. A complete installation of electric light is provided. The propelling machinery is of the quadruple-expansion type, balanced on the Yarrow-Schlick-Tweedy system, which arrangement has been adopted because it practically abolishes vibration due to the action of the engines. The machinery and equipment are in every respect equal to those of the mail steamers on the Cape route, and the *Braemar Castle* has greater speed than any intermediate steamer at present in the service. The trials consisted of several runs over the measured mile at Skelmorlie, during which a mean speed of 15¼ knots per hour was attained, and a cruise down the firth as far as Ailsa Craig.

Indore.—On Saturday, July 9th, this fine screw steamer had a preliminary trial trip in Belfast Lough previous to leaving for Liverpool, where she will take her place in the regular sailings between that port and Baltimore, and other principal American ports. She has been built to the order of Messrs. Edward Bates & Sons, of Liverpool, by Messrs. Workman, Clark & Co., Limited, Belfast, and has accommodation for a large number of cattle under the shelter deck which extends right fore and aft, and also on the bridge. The principal dimensions of the vessel are:—Length, 480 ft.; breadth, 52 ft.; depth, 38 ft., with a gross tonnage of 7,300, and has been built to Lloyd's spar-deck class, under special survey, also with Board of Trade passenger certificate. Three complete steel decks are fitted, also a tier of orlop beams, and the vessel is sub-divided by 7 water-tight bulkheads. The cargo hatches are 8 in number, with a complete arrangement for working cargo. A complete double-bottom extends right fore and aft for water ballast. The officers' quarters are placed in steel houses on the bridge, and are tastefully and comfortably fitted up. The auxiliary engines for steering and other purposes are of the most approved type, and a complete installation of electric-light is fitted throughout. Machinery has also been supplied by the builders, and steam is supplied from four large steel boilers at a high pressure. During the day the *Indore*, with a company on board representing the owners and builders, had several runs of a very successful nature, and it is expected that a speed of about 13½ knots will be maintained on her Atlantic steaming.

Magpie.—On July 9th the new Royal Mail steamer *Magpie*, which has been built for Messrs. G. & J. Burns for the express mail service between Ardrossan and Belfast, made her trial trip on the Clyde. The vessel, which was launched about a couple of months ago, was built and engined by Messrs. A. & J. Inglis. She measures 265 ft. in length, has a breadth of 33 ft., and a depth of 16 ft. 8 in., her gross tonnage being 1,280 and her register tonnage 400. Her I.HP. is 3025, and her speed 16 knots. The vessel is handsomely equipped, and is lighted throughout by electricity. The *Magpie* carries 1,000 passengers, and there are six berth rooms. There is sleeping accommodation for 130 persons. In this connection it may be noted that the sleeping berths are situated away from the dining department, which is a new departure on the Belfast steamers. The *Magpie* will not be put on the express service from Ardrossan until the completion of the alterations on the harbour, which will be at the end of the summer or the beginning of the winter season. Meantime the *Magpie* will run on the mail service between Glasgow, Greenock, and Belfast.

Azul.—On Saturday, July 9th, the s.s. *Azul*, a fine large steel screw steamer built by Messrs. Wm. Gray & Co., Limited, to the order of the Buenos Ayres and Great Southern Railway Co, and Messrs. Arthur Holland & Co., of London, left West Hartlepool for her trial trip. She is specially designed to carry a very large number of cattle and sheep on her decks, and a large measurement cargo in her holds. She takes Lloyd's highest class, and is of the following dimensions:—Length, overall, 336 ft.; breadth, 48 ft. 9 in.; and depth, 24 ft. The deck erections consist of a full poop, long bridge and top-gallant forecastle. The saloon and captain's and officers' rooms, and passenger accommodation are fitted on the bridge. The hull is built with deep frames, cellular double-bottom for water ballast, and a large afterpeak tank. Six steam winches, steam steering gear amidships, and screw gear aft, patent direct steam windlass, marine-type donkey boiler, stockless anchors, and a complete outfit, have been fitted for a first-class cargo boat. Three-cylinder triple-expansion engines have been supplied by the Central Marine Engine Works of Messrs Wm. Gray & Co., Limited. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., and very large steel boilers, having a pressure of 180 lbs. per square inch, will give an ample supply of steam. The *Azul* went out in the early morning, and after being manœuvred for the purpose of having her compasses adjusted by Mr. Berry, a full speed trial was made, the mean result of several runs along the coast giving an average speed of 11½ knots. There were present Mr. Arthur Holland (managing owner), Mr. Grant (of the Great Southern Railway Co., Buenos Ayres), Mr. George Walker (consulting engineer, under whose inspection both the hull and machinery have been built), and Mr. Barclay (superintendent engineer to the company), on behalf of the owners; Captain Murrell and Mr. Purvis representing the shipbuilders, and Mr. Lindsay the engine works. The machinery ran with great smoothness and without hitch, the boilers remaining perfectly tight, and entire satisfaction was expressed with the performance of both ship and machinery. On the conclusion of the trials the vessel proceeded in ballast to Leith to load for Buenos Ayres.

Marselisborg.—On July 12th, the s.s. *Marselisborg*, a steel screw steamer which Messrs. Wm. Gray & Co., Limited, have built to the order of Mr. C. K. Hansen, of Copenhagen, went on her trial trip. The vessel takes Lloyd's highest class, and is of the following dimensions:—Length overall, 329 ft.; breadth, 46 ft.; and depth, 23 ft. 6 in. The engines have been supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited; the cylinders are 23 in., 36½ in., and 62 in. diameter, with a piston stroke of 39 in., and steam is supplied by two large steel boilers working at 160 lbs. pressure. There were present on the trial trip Mr. Hansen, of Copenhagen, managing owner; Mr. Andersen, Copenhagen; Mr. Pinkney, Mr. R. Morel, Cardiff; Mrs. Dempsey, London; Miss Murrell, Barry; Miss Murrell, Hartlepool; Mr. W. R. Brodrick, consulting engineer, of Hull, under whose inspection the hull and machinery have been constructed; and Mr. Albert Trechmann. The vessel was under the command of Captain Hartmann, and the shipbuilders were represented by Captain J. E. Murrell, and the engineers by Mr. Lindsay. The trial was a very satisfactory one in all respects, and after its completion the vessel proceeded in ballast for Canada.

Blanefield.—On July 22nd the steamer *Blanefield* left the shipbuilding yard of Messrs. Short Brothers for trial trip, which proved in every way satisfactory. After adjusting compasses a series of runs was made over the measured mile, and a mean speed of 13 knots was attained. The vessel has been constructed of steel to the highest class in Lloyd's Register for the Seafield Shipping Co., Ltd., of which company Messrs. Lawther, Latta & Co., of London, are the manager. Her dimensions are, length, 352 ft.; breadth, 45 ft.: moulded depth, 27 ft. 9 in., and will carry 5,800 tons deadweight, special attention having been given to the arrangement of the upper and main decks to enable a large number of cattle to be carried. Her engines are by Messrs. George Clark, Ltd., of Sunderland, having cylinders 24½ in., 40 in., 66 in. by 45 in., and large boilers working at 180 lbs. pressure and fitted with Howden's forced draught. After the trial trip the vessel proceeded to Cardiff to load for River Plate under the command of Captain Golborne.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

NUMBER OF STOKERS FOR WATER-TUBE BOILERS.

To the Editor of THE MARINE ENGINEER.

SIR,—Commenting on Messrs. Halliday & Seabury's paper on "Water tube Boilers" in your issue for the current month, you state that "Mr. Lawrie wondered how many stokers would be found necessary above the ordinary number allowed."

I shall esteem it a great favour if you will kindly allow me to state my position on the point referred to. I took the best authorities I could find on the number of men required for water-tube boilers at a given power, viz: Mr. Gretchen and *Engineering*. Their figures I compared with the number required for a given power with cylindrical boilers, and up to the present moment I have not seen nor heard my figures disputed. Why you say I "wondered, &c.,' I cannot understand, because my figures were capable of disproof if wrong, and until someone disproves them, surely I am entitled to hold that they are correct.

Yours faithfully,
WM. LAWRIE, Supt. Engineer.

Palace Steamers' Office,
60, King William Street, London, E.C.
June 29th, 1898.

PATENT LAWS IN FINLAND

To the Editor of THE MARINE ENGINEER.

SIR,—The State of Finland has now, following the precedent set by several of the European kingdoms, promulgated a new Patent Law, which in many respects is more liberal than the old one. Patents will now be granted for 15 years for any new invention, with the exceptions of articles of food, drink, wear, medicines, or chemical substances. Inventions, however, for a new process of manufacturing these can be patented. The granting or publication of a patent abroad will not prevent the grant or issue of a Finnish patent, provided the application therefor be made within six months of such publication. An annual tax will be payable upon the patent when granted, commencing at about £2, and increasing periodically to about £4 10s. Three months' grace is allowed for the payment of such taxes before the patent becomes void. Within four months after publication of the patent anyone may enter opposition to the granting of it on the ground that the invention is not new, or that the invention was fraudulently or illegally obtained from another person, or that the patentee has not the sole right to the invention, and in either of the latter cases the aggrieved person may claim the patent. The invention must be worked in the country within three years of the date of the patent, or otherwise the patentee is bound to grant licences to other persons to work it. An assignment must be filed at the Finnish Board of Trade and entered in the Register of Patents. The proprietor of a patent granted under the existing law may apply for a new patent for the unexpired term of the existing patent.

Yours truly,
W. P. Thompson & Co.,
Patent Agents.

6, Bank Street, Manchester.
18th July, 1898.

Miscellaneous.

Messrs. J. & E. Hall, Limited.—As the result of their recent extensive additions, Messrs. J. and E. Hall, Limited, have made to their works at Dartford, Kent, which, by the way, is the third time that this has been necessary during the past few years, we hear that they have been turning out refrigerating machines on their Patent Carbonic Anhydride System for the last four months at the rate of 15 per month, that is to say, a total of 60 machines in 4 months. This is a result that they may well be proud of, as many of the machines were of large size, such as those for Messrs. Houlder Brothers and Co.'s two latest ships, which have a capacity of over 2,000 and 3,000 tons weight of meat respectively; also those for the White Star Line for their s.s. *Nomadic* and *Tauric* for the carriage of chilled beef; machines for the United States Steamship Company of Copenhagen, for the carriage of about 900 tons of butter and bacon in each ship; and Messrs. Thos. Wilson, Sons & Co., for the same trade. The British Admiralty have had several more machines from J. & E. Hall, and the new Japanese battleships have been fitted by them. For the carriage of fruit and preserving provisions, &c., Messrs. Hall have executed more orders for the Union Steamship Co. and Messrs. Donald Currie & Co. Other machines have been supplied to the Oriental Steamship Co. of Japan, Nippon Yusen Kaisha, Baron Rothschild's new twin screw yacht, the *Atmah*, the Russian Volunteer Fleet, and many others. They still have in hand orders for no less than 75 machines, either fitting or to be fitted on board ship, and a large number of machines for land purposes as well, which comprise almost every trade for which refrigeration is required. It is interesting to note that Messrs. J. & E. Hall, Limited, have fitted and on order for the largest and best known steamship companies no less than nine installations each for two of the companies, seven more companies that run into from four to six installations apiece, and 10, 17, 18, 23, 28 and 30 installations respectively for others.

The Japanese Mercantile Marine.—In shipbuilding Japan is rapidly becoming a competitor with which this country must seriously reckon. The papers which have just come in tell us that an important function was performed at the Mitsinbishi Shipbuilding Yard, at which 1,500 guests and visitors attended. It was the launch of the steamer *Hitachi Maru* for the Nippon Yuson Kaishai. The vessel was classed 100 A1 at Lloyd's; its length is 462 ft., beam 49 ft. 2 in., depth 33 ft. 6 in., and average draught 25 ft.; its tonnage is 6,150 tons; displacement 11,660 tons. Her engines are triple-expansion twin-screw, and indicated 3,500 HP., the speed being 14 knots.

In Japan there are 71 shipbuilding yards, and 28 in Osaka. The steamers constructed during the year were 54 in number, though the largest were only about 600 tons burden.

The Japanese mercantile marine is of considerable dimensions. It consists of 735 vessels with a gross tonnage of 390,334 tons. Of these 570 are steamers and 165 sailing vessels. The great bulk is engaged with the home trade, yet no less than 115 steamers and five sailing vessels were engaged in foreign trade. A number of these received special grants from the Japanese Government under the law for the encouragement of navigation. For every 1,000 tons and 10 knots speed the grant is at the rate of 25 sen per ton per 1,000 miles; for every additional 500 tons 10 per cent. is added, with an increase of 20 per cent. more for each additional knot. The Nippon Yuson Kaishai is a prominent competitor for the carrying trade to and from Japan.

The freights to London last year were 32s. in British lines and 30s. 6d. for the Japanese line. The latter, however, varied, due to local reasons; at the end of December it went down to 22s. 6d.

Number of Stokers for Water-Tube Boilers.—We draw attention to the important communication raised by Mr. Lawrie, the superintendent engineer of the Palace Steamers Company. Mr. Lawrie rightly draws attention to the question of the number of stokers usually employed on the Government ships fitted with water-tube boilers. In the discussion on Messrs. Halliday and Seabury's paper Mr. Hulme, of Messrs. Caird & Rayner, rose and contributed to the discussion. Mr. Hulme spoke with some authority, for he had been on a trial trip of some considerable distance. He informed the meeting that no greater number of stokers were required in the particular case which came under his notice than in the case of the cylindrical boiler of the same power. He went further, and said that he would not hesitate to take charge of the stoking of a battery of water-tube boilers with the same number of men as are allowed to cylindrical boilers of the same power. But it may be quite true that in the particular cases cited by Mr. Lawrie that a greater number of stokers were employed than is usual in the case of cylindrical boilers of equal power. Yet from a common-sense point of view we do not see any reason why this should be, since not more coal, but less, is required in the case of water-tube boilers than in cylindrical boilers of the same power. Take, for example, the case of the Belleville, with its evaporation of 12·5 lb. of water from and at 212 deg. per pound of coal, and Mumford's latest 12·92 lb., and compare them with the evaporation of any cylindrical boiler. The evaporation is nearly 2 lbs. better in the former cases than in the latter. That is to say, 16 per cent. less coal is required with a water-tube boiler of the same power. There may be a greater number of stokers engaged where water-tube boilers are fitted, but we see no necessity for them.

The World's Largest Wooden Steamer. — A remarkable blending of what is newest in modern marine engineering practice, with what most shipbuilders and owners in this country would consider thoroughly obsolete is exemplified in the American steamer *Thomas Cranage*, recently built on Lake Michigan, and now doing freight service on the Great Lakes. This consists briefly in triple-expansion engines using steam at 160 lbs. pressure, being fitted into a splendid ship 330 ft. long by 43 ft. broad, built almost entirely of wood! This vessel is probably the largest wooden steamer in the world, her hull being of Michigan white oak throughout, except the white pine deck planking. Steel is used to a limited extent for the purpose of tying the framework. A belt of steel 14 in. by $\frac{7}{8}$ in. is carried round the heads of the frames, and two similar belts are fitted from about midship to run diagonally to the heel and the forefoot of the vessel respectively. The tonnage of the vessel is 2,200 tons gross, and 1,856 tons net, and the displacement is 4,000 tons. She carries 3,050 tons of iron ore on a draught of 16 ft. 8 in., or a cargo of 110,000 bushels of wheat on a draught of 16 ft. 6 in. Her triple-expansion engines, with cylinders of 20 in., 33 in., and 54 in. by 42 in. stroke, drive a single screw; a feature of some novelty—though of doubtful efficiency—being a universal coupling which connects the crank and thrust shafting to the propeller shaft. The engines and boilers are placed well aft, as in most Lake cargo steamers, the boilers—two in number—being of the Scotch pattern, 14 ft. diameter and 12 ft. long, carrying, as has been stated, a pressure of 160 lbs. per square inch. The vessel, it is said, has a regular sea speed of 13½ knots, and a maximum of 14 knots per hour.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from June 10th to July 8th, 1898.

13003	J. W. Ray. Apparatus for steering ships.
13031	A. Langton. Water-tube steam generator.
13033	C. A. Chappel. Ships.
13062	J. E. L. Ogden. Steam traps.
13067	J. R. Smith. Trawl winch warp guides.
13069	Sir C. S. Forbes, Bart. Steam generators.
13072	G. B. Smith. Preventing fracture in steam pipes.
13097	Bell's Asbestos Co., Ltd., and H. P. Ibotson. Packing ring for steam engine cylinders.

The Marine Engineer.

LONDON, SEPTEMBER 1, 1898.

WE have in former issues drawn attention to the rapid advances in piston speed and steam pressure that are characteristic of the latest designs both of passenger and cargo steamers, and of modern cruisers and battleships of the Navy, and have pointed out some of the many troubles that are arising, and will arise, from such altered conditions. It is a matter of some importance to consider as to when or where we shall find a practical limit to efficiency by such increase of steam pressure and piston speeds in the present reciprocating engines. In our opinion we are not far from such a practicable limit at the present time, and further advances in the development of maximum engine power from minimum weight can only be realized by a complete change in the system of engines to a rotary form, possibly to that of the new Turbinia system, or to an equivalent. Our grounds for this opinion are two-fold. First, to further increase piston speed in a reciprocating engine will marvellously increase the tendency to vibration in the propeller shaft and hull, probably showing after a few years have passed rapid deterioration of the physical structure of the propeller shaft, producing much more fracture than at present, and further rapid deterioration of the hull and its joints. Second, to produce such further increase of piston speed with minimum weight, implies a still further increase of boiler pressure. Though so far the present increase of boiler pressure has not produced any startling crop of accidents or troubles sufficient to cause any outcry against such increased pressures, it must be absolutely admitted amongst sea-going engineers that exceptionally high-pressure engines and boilers give double the trouble and anxiety to keep in perfect condition. Small leakages, which in moderately low pressure engines and boilers would only produce a "weep," easily stopped by tightening a joint, where it is a flanged joint, or by caulking where it is a boiler joint, will, under even the present high range of pressure, give great trouble to control. As regards engines, this will be seen in the difference of the trouble experienced in the up-keep of the high-pressure cylinder, its glands and bearings, of a triple-expansion engine as compared with that of the low-pressure cylinder. The charring of lubricants and packings under the excessive temperature of high pressure steam is a fruitful source of trouble. The question then ensues, *Cui bono?* Are we getting a corresponding advantage in efficiency and economy from the use even of the more extreme pressures at present in use? and should we get any further advantage from increasing these pressures in the present system of reciprocating engines? We doubt it. As regards efficiency, we consider non-liability to break down either temporarily or completely is one of the most important considerations as to efficiency. As to economy, as all modern marine engines work eventually by condensation on a vacuum, any increase in initial pressure means an increase in the ratio of expansion. Theoretically this would appear to be a direct gain in economy to whatever degree such expansion is carried. Practically we submit there is a definite limit to the maximum range of economical expansion. This limit is, we consider, reached much sooner than is thought, and may be explained as follows: There is always a dead load and a live effective load on any engine, and the larger the percentage of nett effective work to dead load produced by any engine the greater is the economical efficiency of that engine. When the effective pressure in any cylinder has fallen below the average pressure required to overcome the dead load, such cylinder is no longer doing effective work, and the engine only continues to rotate at the expense of such other cylinders as are developing more work than that required for the average dead load. Any cylinder which is thus effectively inoperative is so much waste space and waste metal, and is actually robbing the effective cylinders of part of their work. If the area of a low-pressure cylinder is, say, 20 times that of a high-pressure cylinder in a triple-expansion engine, the reduction of the back pressure by more perfect vacuum to the extent of one pound per square inch is as good as an increase of 20 lbs. in the boiler pressure, and is more beneficial in increasing the proportion of live effective work above dead load, than in the case of the increase of boiler pressure. Assuming then, as is our contention, that we have already reached, if not passed, the limits of economical expansion in the modern high-pressure steamers, this should be capable of confirmation, or otherwise, by shipowners or sea-going engineers: that modern extreme increase of pressure, and consequent ranges of expansion, do not any longer bring with them a correspondingly increased economy in the consumption of fuel for the nett speed results achieved as compared with lower pressure engines. If this be the case, why be troubled with the anxiety and extra care and labour, with increased risk of break down consequent upon such abnormally increased pressures?

CANADA has well fulfilled her promise to take the lead in giving a preferential tariff to goods imported direct to the Dominion from either the Mother Country or from the Colonies of Bermuda, the British

West Indies, British Guiana, British India, Ceylon, New South Wales, and the Straits Settlements, and will be extended to any other British colony or possession, the Customs Tariff of which, on the whole, is as favourable to Canada as the British Preferential Tariff of Canada is to such colony or possession. The other Australian Colonies, Cape Colony, Natal, and New Zealand are conspicuous for their absence from the above list, but no doubt these colonies will soon find it to their interest to qualify for admission to the list. As raw and refined sugar are amongst the articles preferentially treated, this will be good news to the sugar planters of the West Indies, particularly as notice is given that the rebate on refined sugar will only apply to such sugar as may be satisfactorily proved to have been manufactured wholly from raw sugar produced in the British Colonies or possessions. As the rebate of tariff allowed preferentially amounts to one-quarter from the general tariff rates of duty, this reduction is not to be sneezed at, and should largely increase freights between the preferentially-treated colonies and Canada, with a corresponding return of Canadian produce. The iron and machinery trade from Great Britain ought also to feel a considerable impetus, cut into as it has been by American competition across the borders. As a contrast to this favourable prospect for home and colonial work, we regret to see that apparently American steel and pig-iron makers are getting a hold in the Belfast market against Scotch and British competition. It is stated that in May last Messrs. Harland & Wolff, Limited, obtained a first consignment of steel plates from America weighing about two tons each, and it is said at about ten shillings per ton cheaper on quay at Belfast than can be supplied from England or Scotland. It is said also that a large quantity of pig-iron has lately been imported into Belfast from the States. The relative freights from Glasgow, Barrow or Wales, as compared with Atlantic freights from the States to Belfast, must have something to do with this, and this should be looked into by shipowners before the Americans get a firm hold on the Belfast market.

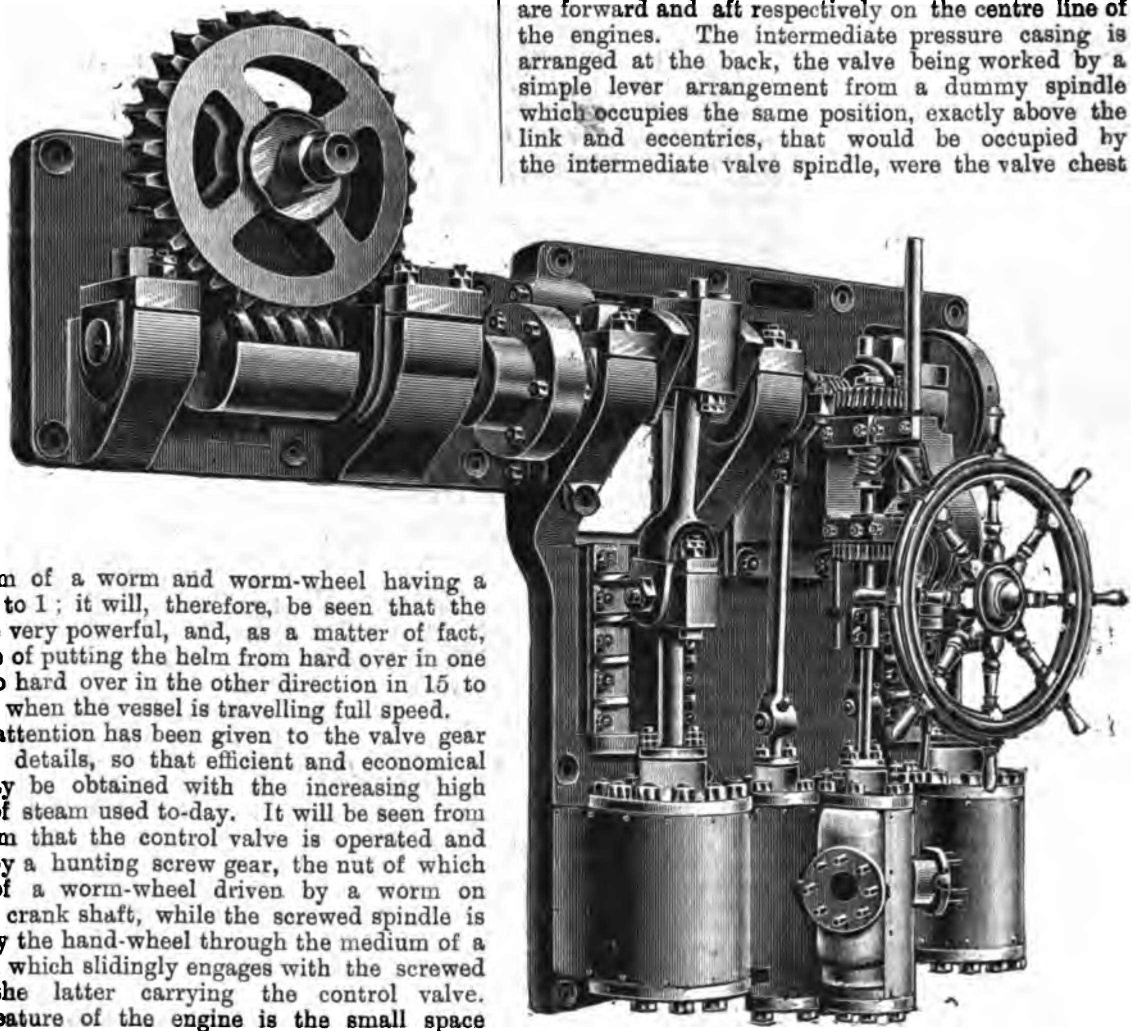
IT is curious that, immediately following our suggestion in a previous issue, that if the North Pole is to be reached with certainty and success, it will be the marine engineer that will have to be employed to do it, such a suggestion has been put forward seriously by a Russian sailor, viz., Admiral Makaroff, the well-known explorer of the Northern Pacific. He believes that a 10,000 H.P. ice breaker could force its way to the North Pole, and that within 12 days. It is apparently confirmed by Dr. Nansen's observations that the icefield about the Pole, if approached from Spitzbergen, present no ancient or compacted range of icebergs, but only icefields of one season's growth, which could be, in our opinion, easily pierced by an ice-breaker particularly designed for the purpose. The Russians, in their ice-bound Baltic ports, have seen something of what can be done in breaking through ice-fields, but we believe their experience has been nothing to that of the Canadians and Americans in the keeping open of ferries on the Hudson. We do not for a moment suggest that a typical ice-breaker should depend only upon its action as a battering ram upon stiff or deep compacted ice-fields; we think its H.P. could be more effectively available in actually cutting or splintering a pathway through such fields by revolving blades or saw faces, such as those used so successfully in modern days for cutting stone and even granite. This form of cleaving mechanism does not appear to have suggested itself to Admiral Makaroff, but we consider his suggestion to have struck the right key-note for success, and he requires only the resources of the engineer to render his idea feasible.

AN International Navigation Congress has been held in Brussels, at which representative engineers from Great Britain, France, Germany, Belgium, and the Netherlands communicated papers as to the characteristics of tidal and other rivers, and as to the construction and maintenance of maritime canals. Of course, Mr. Hunter had valuable information to impart as to the means required for the protection of the banks and maintenance of the full water-way in the new Manchester Ship Canal, whilst Mr. Grenier detailed the works required for maintenance of the Terneuzen Ship Canal running from the Scheldt to Ghent. The material through which this canal runs being almost entirely sand, the works to protect the banks from erosion were most urgent and imperative, consisting generally of vertical sheet piles and stone pitching above. It is a characteristic of the present age this meeting together of all nationalities of experts in various professions, as in the case of the Congress of Naval Architects, to interchange experiences, and a very valuable plan it is, both for the great variety of experience thus interchanged, and the drawing together of different nations in friendly rivalry and amity, teaching each to know the other better, and to recognize the great fraternity of labour.

Board of Trade Examination.—At the recent examination of engineers for the Extra First Class Certificates, one of the successful candidates was Mr. A. Valder, a student from Leask's Marine Academy, where he had only received four weeks' tuition before passing. Mr. Valder now holds the record, the previous holder having passed after six weeks' tuition.

HARRISON'S PATENT STEAM STEERING ENGINE.

We illustrate in the adjoining diagram a steam steering engine, which is built by the Harrison Engine Co., Limited, of Cross Lane, Manchester, and which has been specially designed and constructed for efficiently steering large warships. The engines, which have two cylinders, 10 in. diameter and 10 in. stroke, are adapted to drive the steering gear through the medium of a worm and worm-wheel having a ratio of 15 to 1; it will, therefore, be seen that the engines are very powerful, and, as a matter of fact, are capable of putting the helm from hard over in one direction to hard over in the other direction in 15 to 20 seconds when the vessel is travelling full speed.



Steam Steering Engine.

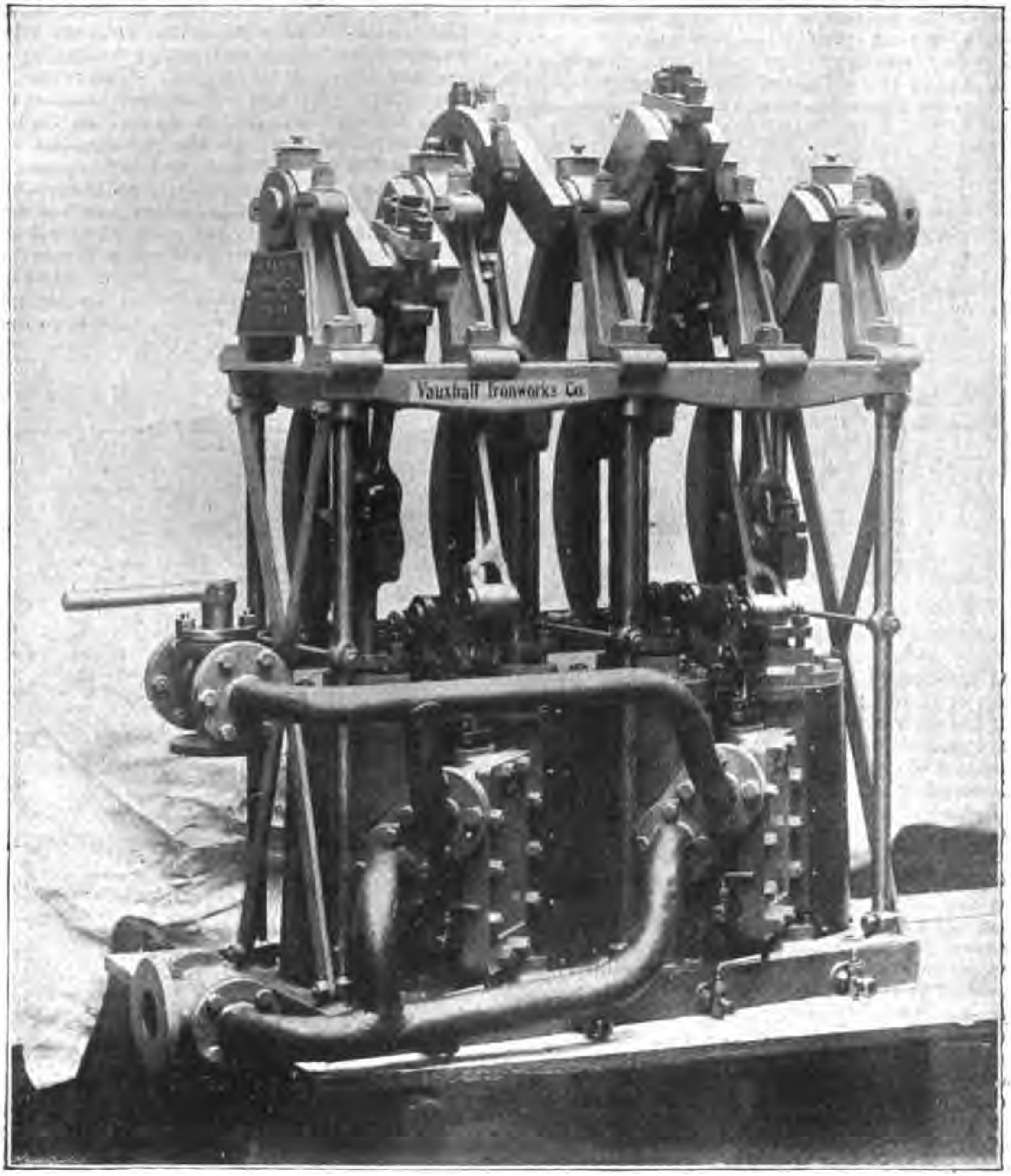
Special attention has been given to the valve gear and piston details, so that efficient and economical results may be obtained with the increasing high pressures of steam used to-day. It will be seen from the diagram that the control valve is operated and governed by a hunting screw gear, the nut of which is part of a worm-wheel driven by a worm on the engine crank shaft, while the screwed spindle is operated by the hand-wheel through the medium of a spur-wheel which slidingly engages with the screwed spindle, the latter carrying the control valve. Another feature of the engine is the small space required. The one illustrated is arranged to bolt on to the bulkhead, and occupies a fore and aft space of 2 ft. 6 in. over all.

The engine is adapted to be easily controlled in the engine-room and from various stations in different parts of the vessel by means of specially constructed controlling gear, carefully adjusted and supplied with the engine, which permits of it being easily controlled by one man from any part of the vessel. The Harrison Engine Co., Limited, have just completed an installation similar to that illustrated as steam steering gear for H.M.S. *Vindictive*, which is being built and engined at Chatham Dockyard.

THE VAUXHALL IRONWORKS CO., LTD.

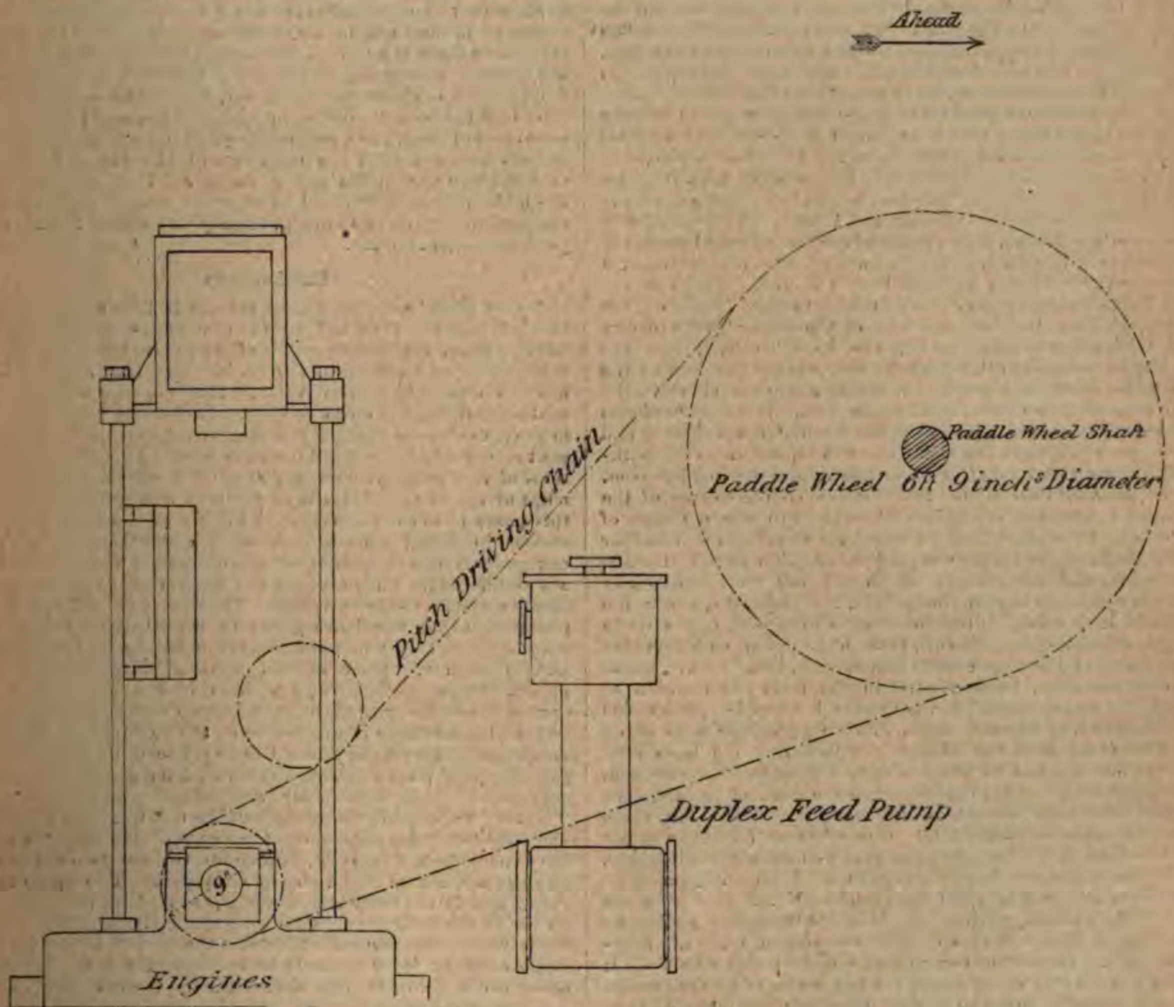
Among the work which is at present in hand by the Vauxhall Ironworks Co. is a set of compound engines with cylinders 14 in. and 28 in. diameter, and 18 in. stroke, designed to indicate 250 I.H.P. These are of the ordinary type, with cast-iron condenser, and pumps worked by a lever on the low-pressure engine. There are also in the shops two sets of triple-expansion engines, with cylinders 6 in., 10 in. and 17 in. respectively, and 10 in. stroke. In the arrangement of these engines the high pressure and low-pressure casings are forward and aft respectively on the centre line of the engines. The intermediate pressure casing is arranged at the back, the valve being worked by a simple lever arrangement from a dummy spindle which occupies the same position, exactly above the link and eccentrics, that would be occupied by the intermediate valve spindle, were the valve chest in the usual position, between the intermediate and low pressure cylinders, thus making all three valve gears identical as far as eccentric rods, links, and reversing gear are concerned. This arrangement enables the intermediate valve to be overhauled as easily and perfectly as high and low pressure valves, and considerably shortens the overall length of engines. The pumps, consisting of air and feed, are worked by a separate steam cylinder, and the low-pressure column forms a jet condenser. This leaves the engines perfectly balanced.

There are also in hand several sets of independent condensers of about 500 sq. ft. cooling surface, having compound condensing engines of 5 in. and 10 in., by 9 in. stroke, arranged horizontally on the top and working a large vertical air-pump at the side.



Four High-Pressure Cylinder Engines, by Vauxhall Engineering Co. Fig. 1.

The company is also erecting a four-cylinder high-pressure engine, designed to indicate about 70 H.P. It consists of four vertical cylinders 6 in. diameter and 12 in. stroke, working a four-throw crank shaft above them. The cylinders are arranged in pairs, with valve chests at 45 degs. to the centre line of the shaft. This brings each pair of valve spindles in line across the engine, so that each pair can be actuated by one eccentric working a rocking lever, to which are linked the valve spindles. This arrangement reduces considerably the overall length, and makes the engine very compact, and consequently reduces the weight to a minimum. The whole engine, with its four cylinders, only weighs 19 cwt. As cast-steel gives a stronger casting than cast-iron, that metal has been used for the castings in order to reduce the weight. These engines are on order for a gentleman in the north, who will use them to provide the motive power for a propeller of a novel kind he has invented. The engines were to be of the greatest possible power, with the least possible weight and smallest possible dimensions. These are shown in Fig. 1.



ENGINES GEARED DOWN FOR EAST INDIAN COAST LAGOONS. FIG. 2.

There is also in course of construction a set of geared paddle machinery and wheels for fitting to native-built hulls for use on the East Indian Coast lagoons. To reduce weight and gain simplicity the engines have been made small, the cylinders being 6 in. and 6 in., by 9 in. stroke. These engines are to run at a high speed, which will be geared down to the paddle wheels by means of sprocket wheels and chain. An external copper pipe, placed under the paddle boxes and cooled by the splash of the wheels, condenses the steam. The resulting water returns to the feed tank, and it is pumped back to the boiler by the engine feed-pumps. The boiler is of the locomotive type, fitted with an extra large fire-box, capable of burning wood fuel. The engines and gearing are Fig. 2.

There is also on the floor a fine set of triple-expansion vertical inverted mill engines, 400 I.H.P., fitted with Proell expansion gear to the H.P. cylinder. Sizes of cylinders 14 in., 22½ in., 37 in., by 27 in. stroke.

There is also a number of sets of refrigerating plant being fitted up on the fitting-shop floor; and the pump department is also full for orders for their well-known "Vauxhall" donkey pumps.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The Loss of "La Bourgogne."

COMMANDER AUBERT, of the French Navy, has been commissioned to make a report on the circumstances attending this lamentable catastrophe. From this it appears that the vessel started for the last time from New York at 10 a.m., on the 2nd July. To noon next day she ran 373 nautical miles. At about 11 p.m. on the 3rd, she encountered fog and began using her siren. At about 5.10 a.m. the following morning the quartermasters on the look-out reported the horn of a sailing vessel on the starboard bow. M. Dupont was the officer of the watch, and he at once gave the order "Hard a-port" and rang the engine-room telegraph to "stand-by." But before the helm could take effect the sailer—which, of course, proved to be the

Cromartyshire—immediately struck the steamer on the starboard side. It is believed that at the moment of contact *La Bourgogne* was making twelve knots and the *Cromartyshire* about five. There was a slight swell at the time and a gentle breeze from the south, so that the sailing vessel could not have exceeded the speed named. The place of collision was sixty miles South, 10 degrees East of Sable Island. Immediately upon the collision the steamer was stopped and the wells sounded. No water was found in No. 1, 2, 3, or 4 holds. The order was then given to put the engines ahead and the course changed with the intention of making for Sable Island. But in about ten minutes the engines stopped as the fires were drowned out. By this time the list to starboard, which had been noticeable as soon as the collision occurred, had increased to from 35 to 40 degrees, and the vessel was settling by the stern. At 5.50 a.m., but fifty minutes after the collision took place, *La Bourgogne* went down stern first. She took with her all the engineers on watch, the captain on his bridge, all the deck officers, every passenger of either sex in the saloon (these had congregated near the bridge so as to be near the captain) and every female on board save one. It appears that the *Cromartyshire* struck the steamer forward on the starboard side and that the angle of the blow showed that it was a glancing one leading aft. The first wound was abreast of the bakery. This contact demolished No. 1 boat, which was hung forward of the bridge, the bowsprit of the sailing vessel sweeping away not only this boat, but also part of the bridge itself, a whale boat (No. 3) and another boat (No. 5). Whilst at the same time the overhanging bows broke into the fabric of the hull, making a vast hole at the level of the upper 'tween decks. This involved stateroom No. 65, the ladies' saloon, and the lavatory immediately aft, whilst the plates below the deck at the water line were also stove in. Scraping along the side of the mail steamer, the *Cromartyshire* passed on. One of her anchors broke away from its cat head with the force of the collision and made a second hole at the water line and burst in also the bulkhead which divided the after boiler-house from the engine-room. It thus knocked into one the two principal compartments of the ship and at the same time threw them open to the entrance of the water. Yet a third time *La Bourgogne* was struck still further aft, so that another injury was made to her skin in the steerage quarters on the lower deck. It is believed that before any attempt was made to save themselves, the engineers, under the orders of their chief, M. Dulido, closed all the watertight doors in their department. But this, though the doing so redounded to the credit of the engine-room complement, could hardly, under the circumstances, have effected in the least the chances of saving the vessel herself or the lives of her people. The vessel was holed in four compartments, and no passenger ship afloat could have long survived such an experience. We have seen that three of the twelve boats were destroyed by the collision. The rapid heeling of the ship rendered the work of getting out the port side boats almost an impossibility, whilst but three were left on the starboard side. One of these (No. 7) was got into the water but it became entangled with some gear alongside, and before it could be freed the after funnel fell upon it, smashing it to pieces and causing great loss of life. No. 9 boat was got away safely with 45 persons in it and it afterwards picked up twelve more, thus doing its duty in rescuing a total of fifty-seven souls. The last boat on this side of the vessel was No. 11, and this is the one which was taken possession of by the foreign (*i.e.*, non-French) seamen, whose behaviour has been deemed worthy of further inquiry. Now as to the port-side boats. No. 2 was smashed on the side of the vessel in an attempt to lower her. No. 4 was got into the water, very badly damaged. She, however, succeeded in saving some fourteen people. The remaining even number boats could not be lowered at all, owing to the list, and all that could be done was to cut their lashings and leave them free in the hope that they might float when the big ship sank from underneath them. On their keels and on the four safety rafts with which the steamer was provided, about 76 more people found safety.

This is briefly the story as settled by the French Commissioner after receiving the depositions of the survivors.

The inquiry at Halifax exonerated the master of the sailing vessel from blame. There would seem little ground in Captain Aubert's report for any attack upon Captain Henderson. His speed was not excessive and he could do nothing to avert the collision or to keep himself alongside the steamer. For if her speed was but 12 knots, as suggested, her way would soon leave the sailing vessel astern, even if the engines had been immediately stopped. The Colonial Court of Inquiry dwelt on the desirability of the vessels of the Compagnie Genérale Transatlantique adopting the tracks recognised by the first-class mail lines. And it would certainly appear that if *La Bourgogne* had been on the usual track she would not have encountered the *Cromartyshire*. She might, however, have met some other sailing vessel with equally disastrous results. Hitherto the captains of these steamers have had no orders as to route, the company leaving them full discretion on this point, and thereby in no way lessening their sense of responsibility. A further inquiry is being undertaken by the French authorities into the charges of barbarity and want of discipline urged against certain of the survivors. But as it stands the story is sufficient to shew that there is still great room for improvement in the design of modern ships. Protection against the fatal results of side blows there is none. The old system of stowing the lowering boats is universally adhered to, although it is recognised from common experience in disaster, that with a heeling ship at least half the none too liberal provision of boats are useless. The behaviour of the officers, engineering and navigation alike, seems to have been worthy of the best French traditions, and the story of the saloon passengers going down *en bloc* at the foot of the bridge, where they could be near the master and hear his encouraging words as to the proximity of Sable Island, seems pathetic in the extreme.

Publications.

A very useful and interesting volume is Rhodes' "Steamship Guide," 1898-9. It should be in the hands of all who are interested in the development of steam navigation. This is really the second edition of the book. But the *editio princeps* has now a mere historical value. The present edition is rewritten and brought down to date. It contains much that is of interest to every passenger and much that appeals to the intelligent reader who is debarred from sea trips. It is full of illustrations of steamships, coloured plates of house flags and funnels, maps of routes and portraits of the men who are associated with this phase of our modern life. A history of the more important steamship lines, an account of the development of steam navigation, and biographies of men connected with the industry are all afforded. Then there is the information which appeals more especially to the traveller. The names of all the important ports in the world are given in alphabetical order. The map in which they will be shown is indicated, so is their latitude and longitude. Then follows a brief reference to their important characteristics and a note of the pages at which particulars of the lines plying to the place under treatment will be found. As far as I have tested it, the book is very accurate, and the only adverse criticism I have yet seen in a professedly shipping paper, was based on what to my mind proves its complete accuracy. The fault-finder complained that the only "Natal" he found in this place was the obscure Natal in Brazil and not the British colony of that name. He might as well have complained that Italy, France and Germany do not appear. The list is a list of ports, not of countries. The critic forgot that Natal is the name not of a port, but of a country. The writer of the book knew better than those who seek to pick holes in his work. *Durban* or *Port Natal* is the port of the colony, and under either of these names if he had looked for it, the fault-finder would have found his information. I wish Mr. Thomas Rhodes success in his venture. The book is evidently the result of much pains.

Holyhead and Greenore.

The London and North-Western Railway Company has celebrated the advent of the third of their new fast twin-screw passenger steamers to the station by the publication of two interesting and well got-up little volumes. The new Greenore Fleet, of which the *Galtee More* is the third, supersedes vessels which were reckoned comfortable and fast in their day, but which are of a class that the premier railway company of the world now disdains to employ. The new vessels make the crossing of the Irish Sea an all-too-short experience and one of the most memorable episodes of an enjoyable holiday. The two little volumes are well illustrated and are furnished with an excellent series of maps. The first and smallest of the pair tells something of the attractions of Greenore and the neighbouring Mourne Mountains, with the best means to reach them, and the easiest way for those whose time is short to make the most of their brief opportunities. The larger volume is "An Illustrated

Official Guide to Carlingford Lough, the Mourne Mountains, and the Boyne Valley." It is published by Messrs. Ward, Lock & Tyler. The Boyne Valley part of the volume deals with a country whose attraction is chiefly urban and historical. But it is none the less of entrancing interest to Englishmen. For it includes Drogheda, a city which was taken by Cromwell amongst scenes of brutality and (according to nineteenth-century ideas) of cruelty whose memory may well account for the detestation with which the memory of the Protector is regarded in the sister isle. The interest of Greenore, of Carlingford Lough and Lough Neagh, is of a less mixed description. Sport and nature and rural scenes are the sole attractions here, though buildings of antiquarian interest are by no means lacking. To the cyclist, the angler, the pedestrian (or his counterpart, the traveller who drives along the highway) there is every attraction. The requirements of the travelling golfer are not forgotten. Briefly, it may be said that a charming and inexpensive holiday can well be spent in Ireland. And it would be well indeed if more Englishmen took advantage of the facilities offered to them. Political difficulties vanish with close acquaintance. Moreover, the money which is spent on a holiday will do far more good in the "distressful country" than in bursting the pockets of fat and prosperous Continental innkeepers.

The Advantages of Building Ships in Pairs

have been well illustrated by the *Lucania* and *Campania*. It may be remembered that in the early part of July the *Lucania* took nearly six days and a half to accomplish her eastward passage. That was because on July 7th she broke a piston rod in her port set of engines. Of course, with her duplicated machinery, this was a trifling matter, of which even the ubiquitous reporter scarcely heard. She reached Queenstown on the 9th, having, after the accident, maintained a speed of 14 knots with her starboard engine alone. With that she proceeded to Liverpool without any delay and docked. As most of my readers know, the month of July is the period when the Atlantic liners change from their ice-season course to the shorter route, and for that reason it is arranged by all the lines to give their regular mail boats their semi-annual longer overhaul. The reserve ship *Aurania* had therefore been advertised to take the sailing of July 16th, and the *Lucania* was not due out again from Liverpool till the 23rd of the month. She kept her engagement in spite of her mishap, and she did it by means which were, I think, unique. The new parts in her engines could by no pressure have been procured in the time allowed, and if she had missed her turn the sailing programme would have been disorganised, whilst many passengers would have been disappointed. All this was simply avoided owing to the fact that the machinery of the two great Cunarders is absolutely identical and interchangeable. Very early on the morning of July 23rd, the *Campania* came into Liverpool, and as soon as she did so the parts of her engines which were wanting in the *Lucania* were taken out and transferred to the partly disabled ship. The latter fitted them, and sailed later in the day at her advertised time. By August 6th (which was the next advertised date for the *Campania*) the new parts were finished at leisure, and fitted to her. This little incident shews the great advantage of interchangeability of machinery. It is a point which is likely to be of great economy to merchant ships, but which might well be of national importance in the case of vessels in the Royal Navy.

The American Line

has made many changes in its procedure since I last wrote my Notes for this column. In the first place it has felt that the old *Chester* and *Berlin* were quite unequal to the responsibility of maintaining their Southampton and New York service. Accordingly these vessels were retained in New York. Their place on the Southampton line was taken by the Red Star Liners *Pennland*, *Waesland*, *Belgenland*, and *Rhynland*, who inaugurate the new *régime* by the departure of the *Pennland* from the Hampshire port on August 20th. These vessels are doubtless an improvement on the *Chester* and *Berlin*, and a weekly service is certainly better than one which is but fortnightly; but after all the present arrangement can only be a makeshift till the return of the four twin-screw boats. Meanwhile, five Hamburg American boats are to take up the American line's Liverpool to Philadelphia service, from which the Red Star vessels named were diverted. Just at the end of July—though hostilities between America and Spain were not concluded—the United States Government gave notice that they had no longer any use for the liners *St. Paul* and *St. Louis*, and that these vessels would be restored to their owners as soon as they could be put back into the condition in which they were originally handed over. This will, it is said, not be till October, and one can hardly wonder at it, if it be true as stated, that the promenade decks of the vessels have been removed. Certainly, there will need a great deal of work in engines and boilers as well as in hull and passenger accommodation.

Taxes on Travelling.

In connection with the changes necessitated by the Hispano-American war upon the conduct of the business of the American line, I may note the war taxes which the American Government has laid upon sea travelling. In the case of every passenger ticket bought in any part of the Dominions of the United States for any foreign destination, a war tax is being levied. This varies in amount, according to the value of the ticket. Where the cost is under 30 dollars the tax is but a single dollar, though this is at best nearly 3 per cent. of the value, and may be a great deal more. If the value exceeds 30 dollars, but is not over 60 dollars, the tax is 3 dollars. This cannot amount to less than 5 per cent. But if the value exceed 60 dollars the Government pocket 5 dollars. This is the maximum tax.

The Fast Canadian Service.

It will be noticed without surprise, and, indeed, without disappointment, that the arrangements between the Canadian Government and Messrs. Petersen, Tate & Co., are off. A new competitor in the field was not wanted by the shipowning public. The travelling and letter-sending public wanted an efficient service, carried on by strong men. Neither of these classes were satisfied with the arrangements which the Dominion Government had made. The time which has been lost in the execution of the laudable design of the Colonial authorities will be regretted. So will be the discredit which such a failure to complete as has occurred is sure to bring upon the project as a whole. I am consumed with a desire to know what will become of the 20-knot turret ships which we were so frequently assured were getting well advanced for the service of the now stillborn adventure. Here is obviously a chance for one of the established lines in the St. Lawrence or New York mail trade, and no doubt there will be keen competition for the possession of these marvellous vessels.

The Daily Press

fairly surpassed itself when the loss of the Allan liner *Numidian* was reported. It was very soon proved that the rumour itself was absurd. For the *Numidian* had only left Quebec on the same day on which her alleged loss in the Straits of Belle Isle was announced. It is supposed that some wreckage was observed—presumably from the steamship *Ispden*, a well authenticated loss—and that the story that a fine passenger ship had been seen to founder with all hands after collision with an iceberg grew thence. At all events there the rumour was. Being untrue it had to be contradicted. The dear old Daily Press could not be satisfied to give its judgment without falling into the sin of giving a reason. So it added that it could not possibly have been the *Numidian* which was seen to founder "because passenger vessels do not use the Straits of Belle Isle." Since when? Allan's and the Dominion use the Straits, and they are practically the only passenger lines plying to St. Lawrence ports. It might even have been said that it is a very unusual thing for a passenger vessel to go to the St. Lawrence by the alternative route *via* Cape Race. This latter road is not only reckoned more dangerous under ordinary conditions, but it is no less than 170 miles longer. Once in a while, perhaps early in the season, it may be used, but that is all.

Bristol Docks.

Unwillingly indeed, but of necessity, the Bristol City Council has at last accepted the Portishead Dock scheme. It was bound to do something, for the Elder Dempster line was threatening withdrawal, since, in consequence of the slow progress of those engaged in the lengthening of the lock at Avonmouth, expensive and irritating delays were the rule and not the exception with the *Milwaukee* and her sisters. The complete Avonmouth scheme—as I have already pointed out—had been vetoed by the Great Western Railway. The Council themselves seem to hanker after the expensive and difficult suggestion of dockising the Avon. But that is too big and costly for them at present, and indeed promises too little chance of any return in a commercial sense, and so to Portishead they are driven. There they seem more likely to achieve success with the Paddington Potentates. But it is open to doubt if the Masters of the Midland will accede to their petition. The reasons which led the Great Western to reject Avonmouth may well cause the Midland to boycott Portishead. But nothing can be done in Parliament till next session, and that is a long time ahead.

The Union Line

have launched their eighth "G," the *German*. She is a trifle bigger than her predecessors for this service, but is by the Queen's Island people and on the usual lines. She is the second bearer of the name in the fleet, her predecessor having been an iron screw of just over three thousand tons built in 1877 by Messrs. Denny, of Dumbarton, who, at that time, did a good deal of work for the company. The old *German* was sold out of the service three years ago. Messrs. Harland & Wolff are also busy on the new mail steamer for the same owners. This vessel will—in spite of the hint of the chairman to the contrary—surpass in size the biggest vessel hitherto owned by the line. Her name is to be *Saxon*. This is one of the most historic names in the fleet, though it was last borne by a very insignificant little craft. One of the first ships built for the line was the *Saxon* launched by Messrs. Samuda in 1854. She was a little steamer of but 440 tons. The second in the descent was built seven years later, and she was two and a-half times as large as her forebear. The new monster will be about twenty-five times as big.

The Cape Record.

The *Carisbrook Castle*, of the Donald Currie line, has returned from her maiden trip to the Cape with her honours thick upon her. Her captain boasted of a new record made on her outward voyage, viz., that she was so steady that on the whole 6,000 miles of steaming not a single passenger suffered from seasickness. Homewards she did something of a very different nature. She broke the record between Cape Town and Southampton for all lines, accomplishing the voyage in 15 days 1 hour 11 minutes.

The Legislation

of the year 1898 has been remarkable for the passing of the Merchant Shipping (Mercantile Marine Fund) Act, 1898. This Act was intended to benefit the shipowner—at least, it was brought in as a bill in consequence of a shipowner's outcry. I do not think it has benefited the shipowner very largely, though it has thrown various charges (such as the bringing back of distressed seamen from abroad and the costs of examining candidates for Board of Trade certificates) on to the general taxation of the country. One thing it has done that is good. It has removed the exemption of pleasure yachts from the liability to pay light dues (save in the case of craft of under five tons). This is as it should be. People who can afford to have yachts for their pleasure are, above all people, those who should pay for the assistance they get from lights and beacons. But the passing of the Act will strike hard at the so-called public yachts—the old liners who were trying to stave off the evil day of breaking up by carrying excursionists round our coasts and over to Norway. They none of them seemed to be making too good a living. The additional impost will perhaps be the last straw which makes their existence unprofitable. The Board of Trade made a great fuss on account of its insertion in the Act of an encouragement to British shipowners to carry British boys, so that the foreigner might to some extent be removed from our Mercantile Marine. I fancy, however, that the scheme in question will have very little value, as it was hastily conceived and badly executed; and it will very probably prove unworkable, and merely block the way of something more likely to effect the object in view.

The White Star Line,

whose new *Oceanic* is getting near launching point, is said to be contemplating two new vessels which will exceed even that monster's length by 100 ft. each. But these vessels are still very much in the clouds, and any discussion upon them would be decidedly premature.

The line has had trouble aboard its mail steamer *Britannic*. Stewards are alleged to have contravened the United States tariff laws by smuggling lace, and navigating officers have been arrested on a much more serious charge, viz., the improper possession of bonds, said to have been extracted from registered letters in the vessel's mail. Access to the mail rooms was, it is stated, obtained by the use of a duplicate key. The whole matter will be ventilated by the Courts, and at present, whilst I notice the occurrence, I refrain till the charges are investigated from dwelling on the subject.

Marine Engineers

will await with interest the publication of the extended report of the Court of Inquiry which investigated the circumstances attending the loss of the British India Co.'s s.s. *Mecca*. This vessel, as may be remembered, was sunk by collision with the company's s.s. *Lindula* whilst endeavouring to pick up a hawser from the latter which had broken down. The condensed report, as published in the Liverpool *Journal of Commerce*, stated that "the collision was due to a grave error of judgment on the part of those in charge of the *Mecca* in approaching too close to the *Lindula* to pick up a boat with a hawser."

The Court, it is added, "severely censured the engineers on both vessels for their extremely lax style in working." It is unusual, indeed, to find such a pronouncement upon the method of working in the engine-room, and the evidence upon which the judgment is founded will need careful consideration and comment by the profession.

The P. & O. Steamship "China"

is still on the rocks at Perim. After the unsuccessful attempt to float her in July, it was reported that further damage had been sustained by her. Then we heard that blasting had been resorted to from three points towards the centre of the forehold to free her from the rocks which had pierced her skin. On the 13th August again further fresh damage was reported, and the prospects seem gloomy indeed.

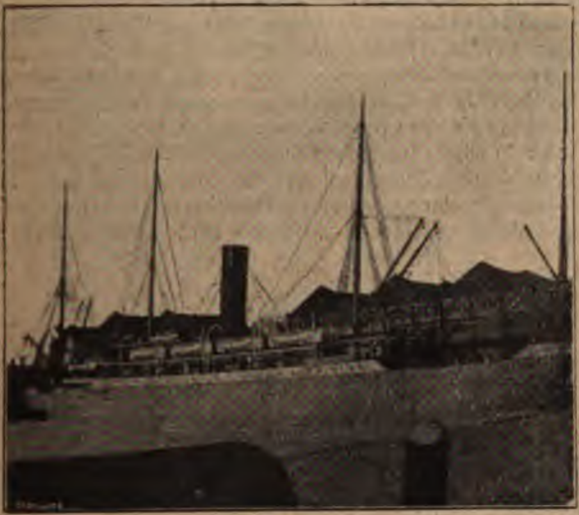
Meanwhile the report of the Board of Trade Inquiry is out. It throws a good deal of light on P. & O. navigation. The *China* was one of their crackest ships. Yet Mr. Crawford, who had charge of the deck, being supernumerary second officer, had but a first mate's certificate. Mr. Brooks, third officer, had only a second mate's. And this in these days when complaints are made as to the low standard of requirement even for master's certificates, and when some lines will not have any deck officers who are not in possession of master's certificates.

The *China* had a patent log but did not use it, the master being of opinion that it was unreliable owing to the risk of its being fouled by waste, seaweed, etc. And it would appear that P. & O. practice is to rely on hand logs. The experience of other liners, and even tramp steamers, would, therefore, appear exceptional. The *order* was that the hand log was to be hove every two hours. But it is not stated when this last order was obeyed. As the master speaks of the manual labour entailed by fulfilling his order, there seems a suggestion that perhaps it was not done quite as regularly as it might have been.

Similar remarks might be applied to the practice on board with regard to the use of the lead. There were put in at the inquiry two circulars as to the undesirability of navigating officers associating themselves too closely with the passengers and their entertainments. These, as the report stands, seems to be apropos of nothing. But there have been rumours of festivity in the saloon on the night of the accident, and the reference to the circulars seems to correspond curiously with the gist of the tales which flew about. Generally the story, as detailed in evidence, seems to point to laxity at headquarters, though the master suffers a suspension of his certificate in spite of his acknowledged pluck and management in handling his people and his boats after the stranding.

The P. & O. Company and its Lascars.

A very unfortunate matter for the P. & O. Company is the attention which has been called to this line's treatment of its Lascars. It is none the less annoying for the company that it is the persistent disregard of the requirements of the law by the management itself which has caused all this outcry. The trouble caused here will not, I fear, cease by affecting the original offenders. The point is this. The Merchant Shipping Act says that a space of 72 cubic feet shall be reserved in the crew space for every member of the crew. I may go further and say that most respectable lines allow their men 120 square feet each, and a committee has recommended that the law be amended to necessitate the larger allowance being afforded. But with the 120 square feet which is voluntary, we have nothing to do here. The law is content with 72 square feet. P. & O., it is alleged, gives its Lascars but 36 square feet. Yet P. & O. ships are British ships, and the British law does not say that there are to be any exceptions in any British ships to the 72 square feet rule. All this is most important. The offender in this case is the P. & O. Company to which the public looks up. It is the only large British Shipping Company which is really prosperous, and it has an immense Government subsidy for its postal services, amounting last year to over £550,000. Its conduct in this regard is, as in others, absolutely regardless of the interests of all shipowners but itself, as well of its own unfortunate men. The travelling public, too, has its health endangered by overcrowding at times. It is much to be hoped, that before next Session of Parliament the directors will have taken the hint now given them, and brought their practice into the limits prescribed by law. For experience has certainly shewn that in this matter, at least, the law's requirements are by no means too high.

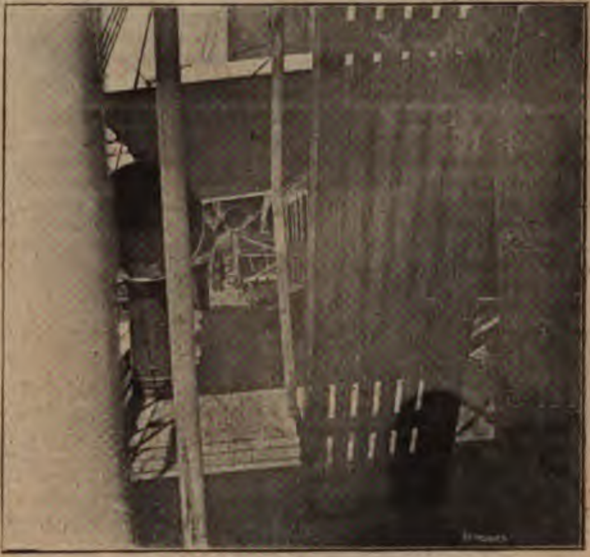


"BRAEMAR CASTLE."

BOAT DECK.

The "Braemar Castle."

The latest, largest and finest of the Donald Currie Packet Intermediate service left London on her maiden trip early on Friday, the 11th August. I had the pleasure of accompanying her as far as Southampton. A very delightful trip it was, with weather the most perfect imaginable and the well-known hospitality of the Castle Mail Packet lavished upon us. The *Braemar Castle* has been fully described in the pages of the MARINE ENGINEER. She is, however, a very noteworthy ship, and I may well say something more about her here. The first of my little snaps shew her general appearance. She is a single screw steel vessel, built in excess of Lloyd's highest requirements, by Messrs. Barclay, Curle & Co. The appliances for safety are great. A double collision bulkhead is fitted forward, and the general arrangement of the bulkheading is in accordance with the requirements of the Bulkhead Committee. A cellular doubl bottom is provided throughout almost her entire length, and complete arrangements are made for carrying a large quantit of water ballast, so as to make her easy and safe when weight cargo is not offering. Sixteen boats are carried on a boat de well out of the way of the passengers' promenade. Of thi higher deck, and of the arrangements of boats and ventilator



NAVIGATING DECK.

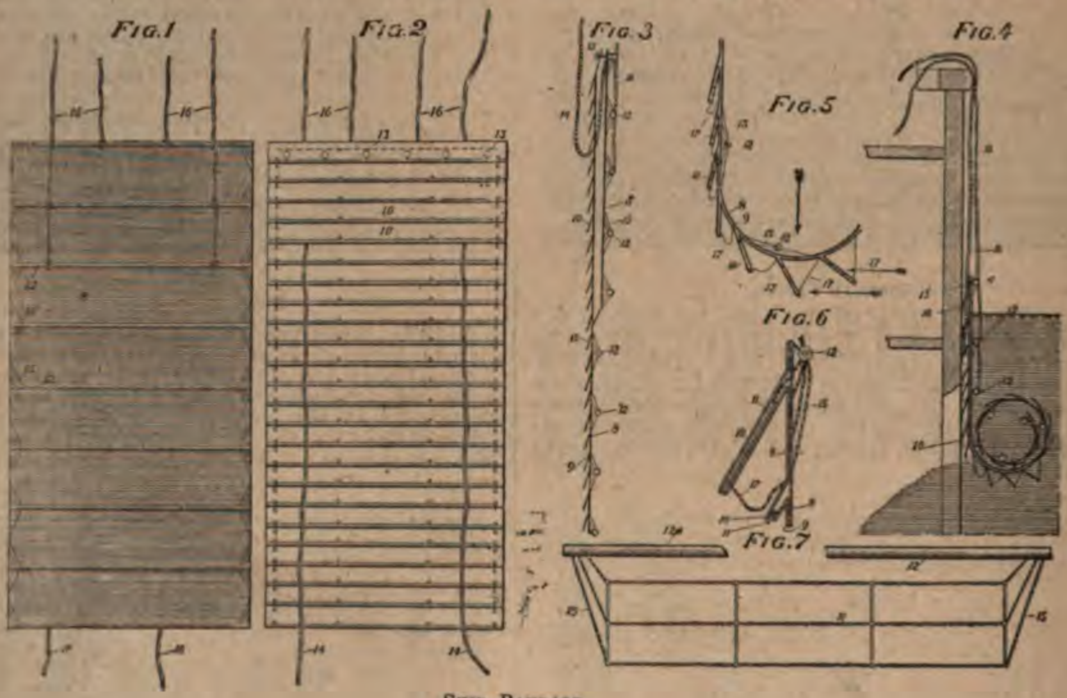
PROMENADE DECK.

my second and third views give some idea. The navigating deck carries the wheel-house, chart-room and officers' quarters. The promenade deck has the captain's state-room forward. The last of my four little pictures, taken from the fore end of the promenade deck on the port side of the captain's cabin shews the roomy fore-waist and the forecastle beyond. In the foreground are the first and third officers. The latter has recently distinguished himself by leaping overboard in the shark frequented waters of St. Helena to rescue a third-class passenger. The sheltered promenade deck carries the smoke-room (panelled in oak like the saloon), the ladies' room panelled in maple and a large number of deck state-rooms of which the after ones—on the part railed off for the intermediate passengers—though possibly "second class," are really quite up to first-class form. The second and third class accommodation, both in state-rooms and public rooms, is unusually good. The great number of saloon state-rooms are on the upper deck, and are very airy and comfortable. Some, however, are on the main deck, and they have each their own little electric fan under the control of the occupants. Ventilation and iced water seem to be laid on in every direction in view of the tropical voyage. The engines are by the builders. They are quadruple, on the Yarrow, Tweedie-Schlick system of balancing, and on the trip to Southampton they well achieved their object, as vibration was conspicuous by its absence. The usual auxiliary machinery is supplied including Hall's refrigerating apparatus, three dynamos for electric lighting, Weir's feed heaters, evaporators, List's feed filters, an electric pump to supply baths and sanitary appliances. Steam is supplied at 200 lbs. pressure by four single-ended steel boilers.

I noticed that the chief engineer has a telephone from the starting platform to his bedside, so that he has every opportunity of being speedily summoned when necessity arises. Owing to the great beam (52 ft. 6 in.) of the vessel, the engine-room is very spacious. The *Braemar Castle* did some 15 knots on trial, so that, if need for her services ever arose in that direction, she is equal to taking her place in the mail service. Altogether she is a fine and comfortable ship, fitted with everything which experience can suggest for the comfort of those on board her. Whilst running down Channel, fire and boat drill were gone through, and it was apparent that the discipline was good, and that though the ship was new her people were well aware of their various respective duties in the event of any emergency arising.

SHIP BANDAGE.

It will no doubt be conceded by all that among the dangers of navigation there is, perhaps, none more dreaded than a collision of two vessels on the high sea. The public is from time to time startled with the report of such an accident involving the loss of ship, passengers, and crew. One of the latest on record is that of the French Atlantic liner *La Bourgogne*. While it is unquestionably true that modern engineering has accomplished much towards increasing the safety of ocean-going vessels, yet it must be conceded that, as far as one can see, a practically unsinkable ship of commercial capabilities will remain a thing of the imagination. Collision bulkheads and watertight compartments no doubt reduce the risk of fatal disaster, but it must be remembered that all ships so provided still retain their vital point in spite of them, as has been shown in many instances. Then, again, there are certain considerations which prohibit the introduction of too many sub-divisions in a vessel. The development of high speed requires much undivided space for boiler and engine room; the necessity of carrying all kinds of cargo makes large holds desirable, and the accommodation of a large number of passengers makes too many sub-divisions impracticable.



Ship Bandage.

In view of these difficulties, a simple device, which appears to possess considerable merit, has been put on the market by the International Ship Bandage Co., of Chicago, U.S.A., which is designed to close or blanket a leak in the hold of a vessel.

Generally speaking the vessel most crippled by a collision is the one that receives the blow, not the one that strikes it, because the latter is usually protected by a collision bulkhead, which, even if the bow be entirely stove in, prevents the water from entering the main portion of the ship. The really dangerous holes or leaks are therefore those that occur in the body, or rather the sides, of the vessel, and it is these in particular which the bandage is intended to close. The holes may be divided into two general classes, viz., the clean-cut hole caused by a straight head-on blow, and the ragged hole caused by a glancing blow. The clean hole is the easier to be repaired from the outside, while the ragged hole offers some difficulties in that respect. The ragged hole generally has a clean surface on the inside, so that it can be propped and shored if the rush of water is not too great. The application of the bandage will in all cases facilitate this operation. It is due to the form of all ships that the holes caused by collisions are almost invariably triangularly shaped, but of various sizes, but seldom exceeding 10 feet in width, while they often extend down to the bilge, and even reach the line of the double bottom. The strength of the frames naturally reduces the effect of the blow, and very often confines a hole to the space between them.

The bandage is made of flexible material capable of being rolled, so as to be applicable to any part of the hull, being capable of adjusting itself to a curved as well as a straight surface. The bandage is strengthened and stiffened by flexible metal layers in order to resist the pressure of water and to prevent any protruding pieces of the hull from cutting or tearing the bandage. Where applied it will lie close against the side of the ship so as to offer little resistance to the water while the ship is in motion.

It is operated from the deck, and requires no weighting for the purpose of unrolling, since it is provided with special means for automatically effecting this by the action of the water.

We illustrate the device in the adjoining diagrams, of which Fig. 1 is an outer face view of the bandage, Fig. 2 an inner face view, Fig. 3 a longitudinal section, Fig. 4 is a part section of a ship showing the action of the bandage when being applied thereto, Fig. 5 is an enlarged section of the bandage showing the unfolding operation, Fig. 6 is an enlarged section of the flaps, and Fig. 7 is a view of the metal frames of the flaps.

Referring to the diagrams it will be seen that the bandage is constructed of a continuous outer layer of cloth 8 and an inner layer 9, having a series of parallel folds forming the flaps 10. Each flap has a wire frame, 11, secured therein, so as to give the flap the necessary weight and stiffness. The canvas layer 8 is stiffened by parallel ribs, 12, stitched or otherwise secured to the canvas layer 8. The inner layer 9 is securely joined to the layer 8 throughout the greater portion of the cloth, but for a short distance at the upper end the layer 8 is separated from the layer 9 and removably connected therewith by a fastening device, 13. Lines 14 are attached to the uppermost rib 13 and run down between the layers 8 and 9 for a short distance, and thence through the layer 9, whereby to manage the loose portion of the layer 9, the purpose of which will be hereinafter explained. Those frames 11 which are adjacent to the respective ribs 13 are connected thereto by means of suitable lashings, 15, shown in Fig. 7. Each end of the bandage is connected with lines, 16, by which it can be handled. The flaps 10 are held so as to swing in a uniform manner by means of stays 17, which respectively run from the outer portions of the flaps inwards to the body shown in Figs. 5 and 6.

In applying the device it is rolled as shown in Fig. 4, so that the flaps 10 will be on the outer side of the roll, and will project outward like the blades of a water wheel.

The roll is then lowered horizontally, and on entering the water, the rush of water entering the vessel will act on the flaps 10 and press them against the hull so as to close the aperture. The pressure of water will generally act quickly on the bandage and hold it in position, but should the headway of the vessel tend to carry away the roll, the loose upper portion of the layer 9 should be released from the fastening devices, 13, and be permitted to drop downward from behind the roll. As this loose portion hangs beneath the roll and over the hole in the vessel the pressure of the water will carry it into the hull and bind it firmly against the edges of the hole, so that the bandage will be fixed in place and the further unrolling can be proceeded with without interruption. The loose portions of the layer 9 are handled by lines 14. By rigging lines beneath the hull of the vessel the bandage may be drawn on at each end and lashed firmly in place, although we understand that it is generally unnecessary to resort to this expedient.

THE MARINE ENGINEERS.

THE examinations of the Board of Trade for the qualifying certificates for sea service, are of great interest to Marine Engineers. At one of the meetings, a paper was read on the subject, and the paper was followed by an animated discussion which was extended over another two sittings. The discussion was followed up by correspondence taking place between the Institution and the Board of Trade; but after a series of letters the Board of Trade dropped the subject, and nothing further was done.

The present appears to be an opportune time to again raise the question. A Select Committee appointed by Parliament has reported on the Proceedings of the Science and Art Department, and if anything should follow the finding of the Committee, there are sure to be changes made, which may be of advantage to marine engineers. Any way, as the Science and Art Department is responsible to Government for the technical instruction of the country, and as the education of marine engineers comes under technical instruction, but little harm, and only good can come of placing the requirements of engineers in this respect before the country.

It appears from the report of the Select Committee, that matters have not been going on satisfactorily for the education of the country under the Department, although from the same report is to be learned that the higher officials of the Department cannot but find things very satisfactory to themselves. It is to be trusted that the Select Committee will not be so foolish as to think that these strictures will make Sir John Donnelly ashamed, and from the shame felt, proceed to mend matters of his own motion. Sir John Donnelly is too old a hand for that; he has flouted the Education Minister and Parliament itself too long to turn in his sleep for them. The Select Committee, if it means to advantage the country and its education will require to be prepared to go in for more drastic measures than simply affronting people to do right at the Science and Art Department.

Mr. W. H. J. Weale was librarian of the Art Library; he has only a European reputation, and in a foolish moment he supposed he could depend on that to carry him through whenever he wanted to do his country service. Mr. Weale has been taught a lesson which he will not soon forget.

The Select Committee called Mr. Weale before them, and asked him a series of questions. Those questions Mr. Weale honestly answered, and the answers showed a deplorable state of things. It may not be known that Sir John Donnelly is a soldier. Any way, the Select Committee recommend that the military garrison should be removed, the Works Department re-organised, and large economies instantly effected. In the Art Museum they recommend a development of the circulation section, and greater care in the selection of objects, and in the labelling of them. The labels are so inaccurate as to be worthless.

The evidence of Mr. Weale brought about many of the recommendations. There is a rule that any official who gives evidence is under the protection of Parliament, and must not be injured in consequence of any evidence he may give. But, as before hinted, Sir John Donnelly is above Parliament and the Vice-President of the Council. Evidence derogatory to the rule at the Science and Art Department was not to be tolerated. So in the words of Sir John Donnelly, "I started him off." The "him" is Mr. Weale.

Well, the one reform which Marine Engineers wish is that doing absolutely nothing for them should terminate. Huge sums of money are annually voted by Parliament for the better technical instruction of the English people, and not a penny of it has yet come in the way of the marine engineer. Numerous correspondence passed between the Institution and the Board of Trade, on the subject of examinations. One does not know that anything was done to divert a part of the large sums annually voted for the education of marine engineers.

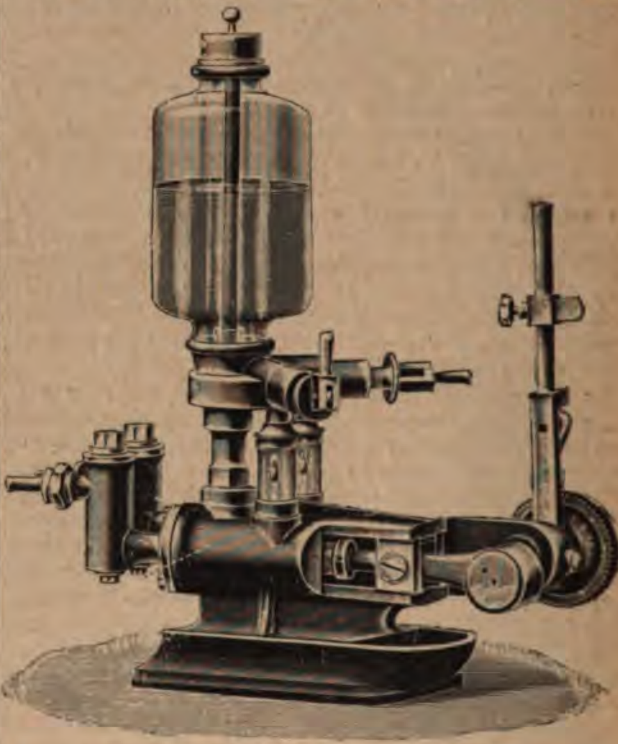
The Institution is some 1,200 strong. It is doing good educational work in reading, printing, and publishing papers at its own expense, and it is slowly furnishing a museum and library. This is education in the true sense. Here is work which Sir John Donnelly might assist at a very small cost, and with great credit to himself. An annual sum, which need not be large at first, might be granted towards the printing of scientific papers, and to the furnishing of a good library. And the money never would be missed.

Then there is the examination of young marine engineers. It was thought that there should be a third-class certificate as well as a second and a first. Why should not the Science Department take this matter up; draw up a course for those who would enter for third-class certificates, and examine them on the subjects of that course. We will take this subject up further at another time, but it is one of great interest to the Institution of Marine Engineers.

The Position and Working Conditions of Sea-going Engineers.—On the vexed question of the position and working conditions of sea-going marine engineers, the Glasgow Secretary of the Marine Engineers Union, in his monthly report issued about the middle of August, has some very outspoken remarks worthy the attention of marine engineers generally, and of shipowners. He says that during the month "certificated men were for a time at a premium, indeed, there were occasions when they could not be obtained. We have often longed for such a time, and calculated on generally improving conditions and remunerations when it did arrive and now we are loath to confess that the time has come and we are hampered by the apathy of the many who are not with us, but who look coldly on and say, 'Get us so and so, and we will join you.' Arguments are worse than useless with such people. At a time like the present, when every trade and profession is benefiting by good trade, we, on on the contrary, are indubitably drifting and deteriorating. Were marine engineers properly combined any reasonable claims would now be irresistible; but we find instead miserable wages in too many cases, and in many cases also a system of semi-starvation. A call at a by-port becomes a perfect godsend, which enables men to go ashore and purchase (at their own expense) a square meal, or the necessaries to make one. That this is no overdrawn picture we have abundance of evidence to show by letters from those who are or have been in this predicament, besides others who have returned here perfect shadows of their former selves, and who give appalling accounts of their treatment and overwork. Only one or two cases refer to Scotch owners, the greatest sinners in this being the English collier and tramp steamers. The remedy is in our own hands. One man or one ship's company can be replaced, but with something like union amongst us we could certainly alter all this."

LUBRICATING PUMP FOR MARINE ENGINES.

THE accompanying illustration shows a new patent positive sight-feed lubricating pump, which has been introduced by the Klein Engineering Co., Limited, of 9, South Parade, Manchester. This pump is specially suitable for lubricating steam cylinders, crank pins, cross-heads, crank shafts, &c., in marine engines, and has already been supplied to several important marine engineering firms on the Clyde and other shipbuilding centres. The lubricating oil is contained in the glass vessel B, from which it falls in drops, regulated by a cone valve worked by levers A. The oil then falls through the glasses C, so that the quantity passing can be distinctly seen. From C the drops of oil pass into the pump chamber D, whence they are forced into the steam-pipe through the check-valve E by means of the pump plunger. The pump is driven by a lever F, to which a reciprocating motion from the engine is communicated. This method of driving necessarily maintains the supply of oil in proportion to the requirements of the engine, as the quicker the latter runs the greater will be the quantity of lubricant delivered. The supply of oil is also adjustable by means of the driving connection on F, and also by the handles A. The lubricator is quite certain in action, the oil being absolutely forced into the steam pipe, cylinder, or other part of the engine for which it may be required. The pumps can be thrown out of gear when required by simply raising the handles A. Another special feature is that once the lubricator is adjusted it remains so, and does not need adjusting every time the engine is started. All that is required when stopping or starting is the lowering or raising of the handles A. The pump will work against the highest steam



pressures, a check-valve being placed between the pump and the cylinder. The glasses are not subject to internal pressure, so that no trouble can arise on account of breakage. The apparatus is throughout very simple in construction, and can be easily taken to pieces for cleaning. The pumps are made with both single and double connections, the one shown in the illustration being, as will be seen, of the double connection pattern.

ELECTRICAL NOTES.

(From our own Correspondent.)

Aluminium for Naval Architectural Purposes.—The electrolytic works at the Falls of Foyers are for the reduction of alumina to aluminium. The oxide is there reduced by the Heroult process, and the metal is run out of the electrolytic baths into ingot moulds. The original crude ingots are next sent to Milton, in Staffordshire, where they are remelted and refined until the metal attains a purity of 99·6 per cent. It is cast into ingots and rolled. At present there are two pairs of rolls 18 in. diam by 42 in. wide; one pair 18 in. diam. by 20 in. wide; one pair 14 in. diam. 20 in. wide; one pair 14 in. diam. 30 in. wide, and a new pair of friction rolls 22 in. diam. 60 in. wide. Its uses are many, its advantages being its great strength and extreme lightness. Its most notable application to marine purposes was made when Mr. Yarrow built a second class torpedo-boat of the metal. Its length being 60 ft., beam 9 ft. 3 in., and weight $9\frac{1}{2}$ tons, the engines being 300 H.P. A mean speed of $20\frac{1}{2}$ knots was attained. The most recent application is that of Mr. White, of Glasgow, who has constructed an 18 ft. boat, for a party going to Klondyke, weighing only $1\frac{3}{4}$ cwt. This boat is made in sections which pack into one another, and the whole can be put in a box. Messrs. Forrestt & Son, Wivenhoe, have also constructed two launches and a barge for Major Gibbon's trans-African expedition, which started in May. These are built in sections measuring 6 ft. 6 in. by 3 ft. 9 in., and weighing less than 120 lbs. The sections are 20 in number, and are interchangeable; the different pieces can be put together in a variety of ways so as to form three separate boats of such sizes as may be most convenient at the moment. It is possible to have two 26 ft. launches, and one barge $22\frac{1}{2}$ ft., or one $44\frac{1}{2}$ ft. launch, and two 15 ft. barges, or one 37 ft. launch, one $22\frac{1}{2}$ ft. barge, and one 15 ft. barge. One launch is fitted with an awning, the other has a mast and sail.

British Pacific Cable.—It is expected that the Government of the Dominion of Canada will contribute one-third, and the Governments of the Australasian Colonies another third of the cost of an all British Pacific cable. Mr. Chamberlain promised in the House of Commons that when such an offer is formally made to the Colonial Office it would receive due consideration from Her Majesty's Government.

Electric Governor for Marine Engines.—Sig. E. Putalo has invented an electric regulator to prevent the engines of a vessel racing when the screw rises above the water. It consists of two vessels of mercury, connected at the bottom by a tube, and mounted fore and aft in the ship. The vessels are about half full at normal depth. When the ship pitches forward so as to raise the screw, the rods connected with the resistance are submerged one after the other, so that an electro-magnet is brought into play, the whole resistance being short-circuited when the screw is quite out of the water. The electro-magnet operates a throttle valve in the main steam pipe, which is thrown open by another magnet. By this arrangement the steam is turned off and on. From experiments, it has been shown that the mercury vessels need not be more than 34 in. apart in a ship 300 ft. long.

Electric Traction of Barges on Canals.—The electric overhead trolley for supplying current is becoming very popular in all applications of traction. A number of experiments have lately been made in France for propelling barges in canals, and two methods have been adopted. In one the traction of the barge is by means of an electric car propelled along the towing-path, which is connected to the barge by a rope. In the other a detachable screw-propeller, worked direct by an electric motor, is used. The current is supplied in either case by an overhead conductor and trolley.

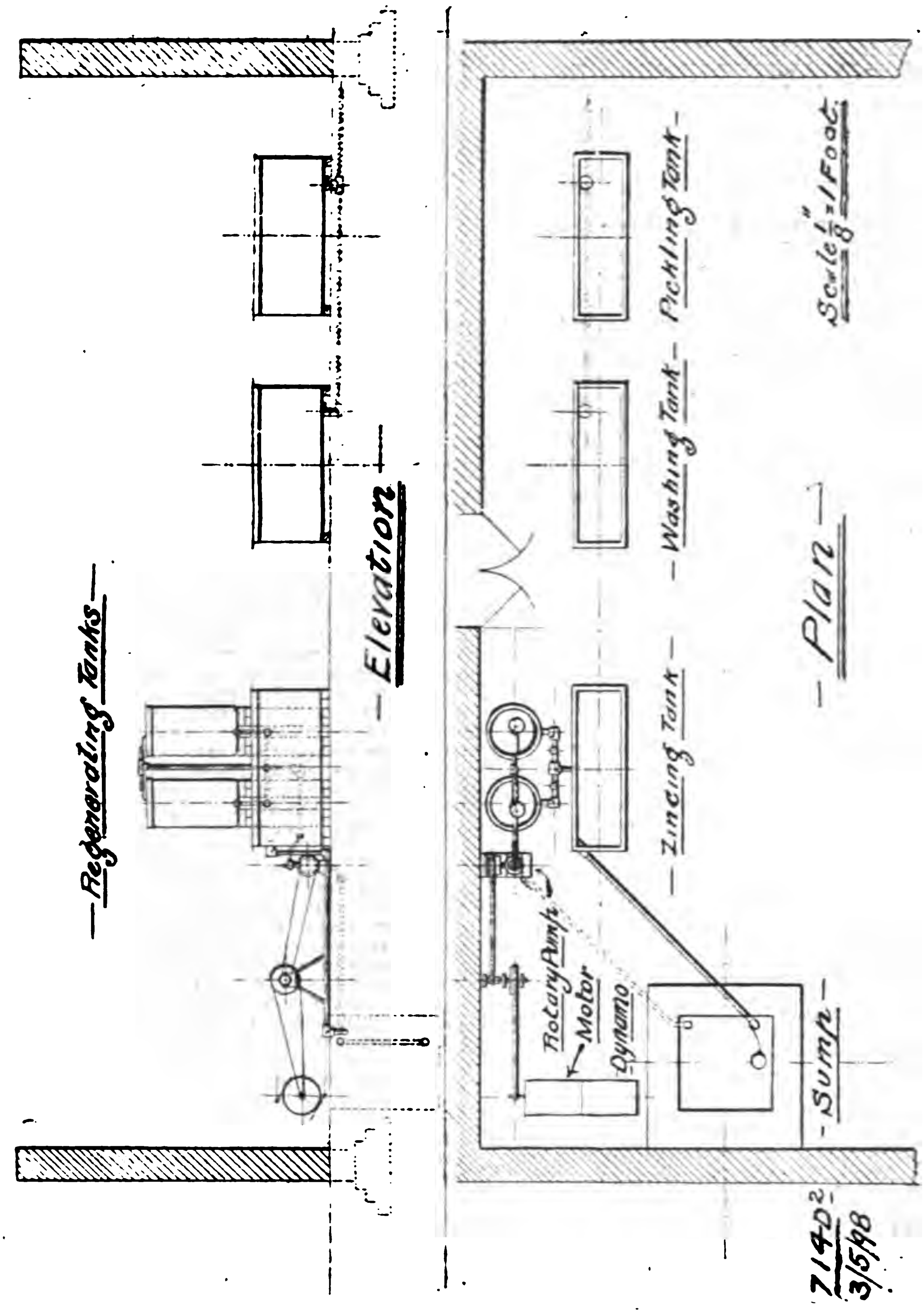
Electric Installation on the Japanese Cruiser, "Chitose."—On this vessel, which is being built for the Japanese Government, there is a most complete installation being provided for the lighting of the vessel and for the electric hoists for the ammunition. The electric current is being produced by three dynamos, each 32 kilowatts capacity, directly coupled to compound balancing engines. The dynamos are compounded for a constant potential of 18 volts, and are required to deliver their output for four hours with a rise of temperature not exceeding 60 deg. F. above that of the surrounding atmosphere.

Electrically Equipped Floating Dry Dock.—The Government of the United States has secured a floating dry dock, and it will be sent at once to Cuban waters. It is 235 ft. long, and can accommodate vessels of 2,500 tons, and so will be able to take in gunboats and small craft. The Spanish Government has one now at Havana which, it is said, cost £180,000. It embodies the best features of the floating and graving types, and its equipment is said to be the most complete in the world. It includes a complete electric-lighting plant and power transmission system, including motors for driving the pumps and operating the hoists. There are two electric generating plants, one in each wall, and they can be used separately or together. Each has its own complete outfit of boiler engine and direct-connected generator. There are ten electric motors, the controlling switches, starters, &c., being in the valve houses. Motors and pumps alike have ball bearings. The pumping machinery is capable of raising 15,000 tons of water in $2\frac{1}{2}$ hours. The dock has a captain, officer, and crew, and is fitted with fore mast, jigger mast, steam steering gear, steam windlass; and anchors.

Action of Lightning Through Water.—Three submarine mines were recently exploded in the Potamai river by lightning having struck the switchboard or some of the connections. So at least it was supposed, and General Wilson investigated the matter and found no marks on either the cable electrical connection or switch board of their having been struck. He believes that one of the mines was directly struck by lightning through four feet of water, and that the others were set off by concussion.

Submarine Boat "Holland."—Mr. John P. Holland, Newark, N.J., has constructed a submarine boat 80 ft. long, 11 ft. in diameter. It resembles a Rugby football. It has a small turret on its outer deck and a small smoke stack. This turret can be closed; it is only used when the boat is on the surface as a pilot-house from which the boat is steered. The smoke stack can be taken in and the aperture closed and made watertight. When on the surface the boat is run by steam, but under the surface by electricity from a storage battery, capable of keeping the boat going for hours. When the boat has to go down the furnace doors are closed and water is admitted to certain compartments. It is made to sink or rise by the tilting of certain rudders. When the boat has got down to its desired depth the motors are started, and she can be propelled at a speed of about eight knots an hour, which can be kept for six hours. On the surface the speed is about 16 knots. On each side there are windows, and the cabins are lit electrically. Air is carried in cylinders, and it is allowed to displace the air, which is expelled by a fan. The water compartments are in the bottom of the boat, and this water is discharged when the boat is required to rise. The coal bunkers are along the sides. The forward end of the boat is utilised from which to fire torpedoes. Behind this is the boiler, clothed in asbestos, and after that the machinery, and last the air compresser. By means of reflecting glasses a view of the water can be obtained while the boat is submerged. The propeller is a single screw driven by a direct-current motor, having a normal capacity of 50 H.P. The current is provided by 60 special type chloride accumulators, having an aggregate weight of 45,000 lbs. They are capable of discharging 300 amperes for six hours, and for a spurt lasting for half an hour 1,000 amperes. The battery cells are constructed of steel lined both inside and outside with lead.

Aluminium Paper Knife.—We have received from the Atlas Metal Co., Limited, of 75, Queen Victoria Street, London, an Aluminium Paper Knife, neatly mounted on a card bearing their name, etc. It is being sent round to engineers and others as a reminder that they are still on the market with their Anti-Friction Metal, notwithstanding malicious statements to the contrary.


Regenerating Tanks
Elevation
Pickling Tank
Washing Tank
Zincing Tank
Sump
Rotary Pump
Motor
Dynamo
Plan
Scale 1/8" = 1 Foot
714-D2
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Cowper-Coles Regenerative Electro-Zincing Process.

COWPER-COLES REGENERATIVE ELECTRO-ZINCING PROCESS.

It is a well-known fact that the essential feature in electro-zincing processes is to have a properly prepared surface upon which to make the electro-deposit, so that great care must be taken to remove all traces of grease and rust.

The grease is usually removed by immersion in a caustic soda solution of about ½ lb. of soda to the gallon of water, or, on the other hand, the grease and the scale are removed by sand blasting. The more usual practice for removing the scale and the oxide, but certainly not the best, is to place the ironwork to be zinced into a hot pickle solution, containing about 1 per cent. of commercial sulphuric acid. The chief difficulty hitherto experienced in the electro-deposition of zinc has been to keep the electrolyte working order, as zinc anodes, whether cast, rolled, amalgamated, or in the form of granulated zinc, fail to keep the solution up to its normal strength.

It is contended that this difficulty has been overcome in the Cowper-Coles Regenerative Process by the use of zinc dust which usually contains 97 per cent. of metallic zinc. The zinc dust or tultz is a greyish amorphous substance, and must not be confused with zinc oxide. It is obtained as a sublimal product in the flues of zinc smelting furnaces. In carrying out the process the zinc dust is placed into tanks which are adapted to produce a regenerating function on the solution contained therein. This is effected by arranging within the tanks a filter bed, consisting of the zinc dust mixed with fine coke or sand, upon perforated grids, situated about half way down the tank.

Any free acid present in the electrolyte is neutralized in passing through the filter bed. If the zinc dust is allowed to get into the electrolyte it is found to increase the electrical resistance. We understand that it has been found from experiment that a zinc sulphate solution, containing 12·59 acid, after passing through a filter bed containing 10 per cent. of zinc dust, was found to contain only ·68 per cent. of free sulphuric acid. In this way the solution can readily be kept up to its normal state and quite free from impurities in suspension, which has been found to be one of the chief causes which lead to the formation of zinc sponge.

We illustrate in the accompanying diagram a set of apparatus for carrying out the process, from which it will be seen that the regenerating tanks are connected to the depositing vat by a system of piping, the electrolyte flowing into the bottom of the depositing tank by gravity, the lighter liquid being drawn off over a sill at the end or in the corner of the vat. One tank discharges the regenerated solution whilst the other is being filled by a small rotary pump from the sump.

The arrangement shown illustrates a plant recently erected for Mr. Peter Brotherhood. The electrolyte is composed of 40 ozs. of zinc sulphate to each gallon of water, and has a specific gravity of 1·1770, which is equal to 19 per cent. of crystallized zinc sulphate.

The anodes are made of lead, and the current density is 17 amperes per square foot, the E M F at the terminals of the generator being 6 volts. A bye-pass is provided so that the solution can be circulated without having to pass through the regenerating tanks.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

Lessons of the War.

IN the *New York Herald* recently, some most interesting interviews with admirals on the retired and active lists of the Navy have been published. The Hispano-American War was the subject of the interviews and the opinions of such well-known men as Sir Vesey Hamilton, Vice-Admiral Colomb, Sir George Elliot, Sir Leopold McClintock, Sir Henry Nicholson, Admiral Sir J. Dalrymple-Hay, and Sir Nathaniel Barnaby, have been obtained. Admiral Sir Vesey Hamilton, when questioned about the various bombardments, said that he considered a modern warship as a weak fort, which should not be pitted against a modern land fort, which is much stronger and does not roll. In his opinion, the most important lesson of the war was that a king with 10,000 men should not war with one with 20,000. Vice-Admiral Colomb does not think the war has thrown any light on belts or decks for armour, and he considers that the war has taught us that destruction by fire is the chief danger. Spain, he considers, lost her best chances of defence by not sending on her torpedo craft to Cuba to concentrate in the harbours likely to be blockaded. In his opinion, the war has taught us the value of a superior steam navy, and that it is no use going to war if your gunners cannot shoot. Lieut. J. Armstrong, late R.N., the author of the well-known book "Torpedoes and Torpedo Vessels," considers that the result of the use of destroyers is disappointing, and if any serious lesson can be learned from the behaviour of the Spanish destroyers—which were seemingly manned by officers and crews who had little experience of them—it is that for torpedo-boat work the destroyer is somewhat too large.

Some further Expressions of Opinion.

Admiral Sir George Elliot, when approached on the subject of the war, said that the experience obtained strongly recommends an all-round belt protection, and armoured shields for all guns. Torpedo boats he considers to have been shewn to be useless for the defence of seaports in daytime, their proper use and limitations being for night attack. It has also taught us the value of adequately-protected coaling stations, the value of fast cruisers, and the great importance to be attached to a steady gun platform for quick-firing guns. Admiral Sir H. Nicholson considers that the war has taught us nothing. The state of the Spanish Navy, said he, has been for years so hopelessly rotten, that when the moment of action arrived, its militant power was nil. He does not believe, however, that the Spanish gunners or engine-room hands did anything like justice to their ships. Admiral Sir J. Dalrymple-Hay considers that the war has taught us that a cupola, in spite of its weight, is the best protection to a gun's crew, as it thus ensures steadiness in action. Admiral Sir Lambton Loraine says that the war has taught us that facilities for obtaining coal are all in all to a fleet, and that where the straight shooting is all on one side, an incalculable advantage remains with that side. Sir Nathaniel Barnaby, who was Sir William White's predecessor in the post of Chief Constructor of the Navy, when asked for his opinion as to any lessons the naval engagements in the war had taught, especially in regard to construction and design, said that he thought that in abandoning "block ships" and "coast defence ships," and putting in the highest obtainable speeds into mere eggshells of hulls with a few inches of armour, the designers have left a great deal to the men who fight the ships, for if by character or by training, they were ill fitted for rushing upon their enemies and disabling them by violent attack, it would have been better to have given them stouter jackets, and to have paid more attention to their fists than to their legs.

The Trials of the "Vindictive."

According to accounts, this latest addition to our fleet of second-class cruisers came through the whole of her trials in a manner highly satisfactory to all concerned. The trials extended over nearly a fortnight. Her engines were constructed at Chatham Dockyard, and her trials, therefore, were watched with a great deal of interest by the officials of that place. In the first thirty-hours' trial, working at 2,000 H.P., not the slightest trouble was experienced with the engines, and the water-tube boilers proved satisfactory in every way. The consumption of fuel at this trial was 2·16 pounds per I.H.P. per hour. The second thirty-hours' coal consumption trial was run with 7,000 I.H.P., and, as before, was completely successful. The coal consumption at this trial was 1·83 pounds per I.H.P, per hour. The *Vindictive* is the first vessel to be fitted at Chatham Dockyard with the Belleville water-tube boilers. These were supplied by Messrs. Maudslay & Co., and are eighteen in number. They have 880 square feet of grate area, and 25,600 square feet of heating surface, and the engines are to steam at 250 lbs. pressure. The diameter of the cylinders is 26 in., 42 in., and 68 in. respectively, the stroke being 39 in. Under the new forced-air pressure the engines were expected to produce 10,000 H.P., and a speed of 19·5 knots.

Portsmouth Dockyard.

As regards work, both building and refitting, there is enough and to spare at this yard. The new battleship which was included in this year's programme, and which was to be commenced as soon as the *Formidable* was out of hand, will now, it is expected, be laid down in the dock in which the *Cæsar* was built. The expenditure in labour and material for the financial year up to the present is some £30,000 under what was reckoned would have been spent, but as soon as this vessel is commenced this surplus will be wiped off. A rumour was for some time current at this yard that the *Terrible*, having finished her vibration trials, was to have a smart run across the Atlantic; but that there is no truth in this will be seen by the answer of the First Lord of the Admiralty to Lord Charles Beresford in the House of Commons. The trials of the *Diadem* are regarded as the severest that any of our large cruisers have been put to. The reason of these severe trials, it is thought, is that this vessel is the pioneer of her class. Her first run was for thirty hours at one-fifth full power, then for sixty hours at one-fifth full power; after that, for sixty hours at three-fifths full power, then sixty hours at four-fifths full power; and, finally, for sixty hours at full power. If the vessel comes through the whole of these trials successfully, there will be no cause for adverse criticism. Work on the *Canopus* makes good progress, and there is little doubt now that she will be completed before the *Ocean*, building at Devonport. Ten more torpedo-boat destroyers are to be added to the reserve at this yard. The *Sylvia* recently made a second effort to carry out her three hours' 30-knot trial, but once more found it impossible to get up a higher speed than 29½ knots, and after two hours spent in vain attempts, the trial was abandoned. It is expected that another effort will be made with her.

Some Naval Questions in Parliament.

In reply to a question by Mr. Forwood in the House of Commons recently, Mr. Goschen gave some interesting information *re* the *Terrible*, *Diadem*, and *Europa*. He said it was the practice on Navy contract trials to include the coal consumption of all the auxiliary engines as part of the expenditure of the main engines. In the trials of the *Diadem* and the *Terrible*, the coal supplied would be the ordinary screened Welsh coal used for normal sea purposes. During the series of sixty-hour trials of the *Diadem* about to be carried out, there would be one at the full sea-going continuous power, when all the boilers would be in use. No pledge could be given as to the other trials, but they would be carried out in the same manner as with tank boilers. The right hon. gentleman must be well aware that tests at maximum powers were not usually carried out for longer periods than were specified in the contracts. In the *Diadem* and the *Europa*, however, a special trial was carried out in each ship of thirty hours' duration at full continuous sea-going power, using three stokeholes only out of four, or 78 per cent. of the boiler capacity, and in these cases the boilers were not changed during the trials, and as the sea-going power was three-fourths of the maximum, this was all but the maximum power of the boilers in use. In reply to a question by Mr. McKillop, Mr. Macartney said that careful examination had been made of the different coals ordinarily used in Her Majesty's ships which had recently been offered. Experimental trials of coal from various north country collieries was to be made at Portsmouth. He also stated that during the continuance of the Welsh coal strike, invitations to tender for coals would be issued to many firms which had hitherto been debarred from supplying the Navy with coal whenever supplies were required. Capt. Norton asked Mr. Goschen why the *Terrible* was being kept in dry dock, what was the nature of the repairs being done to her, were economizers being fitted in her, and what would be the total cost of repairs including all dock charges? In reply, Mr. Goschen said, "The *Terrible* is not now in dry dock. She was docked to examine her bottom, and to investigate the cause of a slight increase of power required in relation to speed. It was found that the friction of the propeller shafts had increased, but it was reduced to the normal amount by simple lubrication. The principal repairs done to the ship were the readjustments of the intermediate slide valves and high-pressure piston-rod glands, and the remaking of joints in various steam pipes. The sequence of the cranks has also been altered to reduce vibration. Economisers are not being fitted. The cost has not yet been ascertained, as the work is not finally completed, it will not be large." Several other interesting questions have been asked. Lord Charles Beresford asked Mr. Goschen if it was not possible to have the *Diadem* make a full speed cruise across the Atlantic. In reply, the First Lord said that the programme of trials did not include this, but were such as would fully test her engines.

The Consumption of Coal by Our Warships.

The differences in the amount of coal consumed by our battleships and cruisers, is one that has often received the consideration of the authorities, and if some statements which have recently been made in a contemporary are correct, the widely different amounts of coal burnt by the ships of the Channel Squadron should be brought to the attention of the Admiralty, if not by a question in Parliament by some other means. We are told that the *Majestic* in one day consumed 49 tons of coal, the *Magnificent*, 56 tons, and the *Hannibal* only 40 tons. Then the cruiser *Arrogant*, with not half the displacement of these latter vessels, consumed 49 tons in one day, while the *Isis* consumed only 24 tons, and the *Furious*, a sister ship to the *Arrogant*, 38 tons. These figures are all for the same day. It is noteworthy that the *Isis*, which apparently burns so much less coal than the *Furious* and *Arrogant*, is fitted with the old service boilers, while the two latter ships are fitted with new water-tube boilers. On the same day as these figures were taken, the *Pelorus*, of not half the tonnage of the *Isis*. *Arrogant*, or *Furious*, burnt 30 tons, 6 more tons than the *Isis*, These facts are certainly worthy of careful consideration by the authorities. The difference in the amount of coal consumed may be due to many causes. The stoking in one ship may have been better than that in another, or the flues in some of the ships may have been in a bad condition, or the quality of the coal may have been different. Many of the ships in the Channel Squadron are now burning North Country coal, and complaints have been made that the captains of the various ships find it difficult to make out the admiral's orders, owing to the dense clouds of smoke which arise from the funnels. Signalling is said to be difficult, and at times almost impossible.

Engine-room Artificers in Trouble.

It has been stated that wide-spread discontent has been created among the engine-room artificers by the order directing that engine-room artificers of the fourth class were not to be included when leave was given to chief petty officers made by Vice-Admiral Stephenson. The actual signal made by the Commander-in-Chief was as follows:—"The Admiral has observed engine-room artificers on leave do not salute him, and walk about with coats unbuttoned, and hats back of their heads, which is discreditable to petty officers, and to the discipline of the squadron. This signal is to be read on the quarter-deck to these men, and a copy of it hung up in every engine-room. Acting engine-room artificers of the fourth class are not to be included when leave is given to chief petty officers." If what the Admiral states is correct, the order is reasonable enough, and it can hardly be believed that engine-room artificers of any standing do not agree with it. Of course, it is quite possible that if the Admiral was in private clothes the men may not have recognised him, but we should think that the Admiral had taken this into consideration before issuing the signal. It is only natural that some annoyance should be felt by those artificers who have not misbehaved themselves in the way mentioned by the Admiral, and it must be admitted that it is rather a draconic proceeding to punish the whole of the young artificers because of the offence of a few. The difficulty in procuring engine-room artificers is well known, and this order will probably have a bad effect on the recruiting.

Devonport Dockyard.

A good deal of forced activity prevails at this yard, especially as regards the *Implacable*. There is little apparent reason for this to the outsider, but financial adjustment is at the root of the evil, for evil it is, if the *Implacable* is to be pushed ahead to the detriment of good workmanship, in order that a vast amount of money may be spent upon her in a given time. Her sternpost has been in position for some weeks, and the amount of material built into her up to the present averages nearly 50 tons per day. The new battleship which is to take her place when she is launched, is, we are told, to cost one million sterling, and she is officially described as an improved *Canopus*. She is to be 400 ft. long, 75 ft. broad, and to have a displacement of 15,000 tons. She will be laid down in January next, and about £32,000 is to be spent upon her during the present financial year. It has been definitely decided to erect a new building slip here, and when this is ready, Devonport Dockyard will be in a position to build two battleships at the same time. The new slip is to be commenced immediately, and the building of it will probably necessitate the destruction of slips No. 1 and No. 2. When the new slip is completed a vessel over 600 ft. long, and of any width of beam, will be able to be built on it, and in addition the ship will be launched into the widest part of the Hamoaze. It is expected that the time occupied in building this new slip will be about twelve months and that the cost will be £35,000. The old line-of-battle ship *Indus*, late *Valiant*, which has been acting as the guardship of Reserves and flagship of the Admiral Superintendent here, is to be paid off. Her place as flagship will be taken by the *Defiance*, an old armour-plated iron ship. The *Defiance* in future will be known as the *Indus*, and the *Indus* as the *Valiant*. Some serious inconvenience has been caused to the engineering staff here by the order made by the Admiralty to mix Welsh coal with North Country coal while the strike is on, and on this account steam trials have been put off which ought to have taken place. Some 2,000 tons of Welsh coal have been delivered at the yard.

Marriage in the Navy.

An argument has cropped up during the last month as to whether the presence of a naval officer's wife with her husband at any place where the ship may be staying interferes with his duties. A correspondent, writing to one of the service papers on the subject, contends that ladies married to naval officers have to assume an apologetic attitude, or at least a very conciliatory one during their stay at such ports abroad as they may elect to visit. The writer also complains that the bluejacket's wife enjoys none of the advantages and considerations accorded to her Army sister, who is taken from one place to another at her country's expense, besides being supplied with board, lodging, and medical attendance for herself and her children. This is a point which will appeal to every officer in Her Majesty's Fleet of both the executive, engineering and civil branches. Of course, there is no law or order to prevent either a seaman or officer from paying his wife's passage abroad, but then the case of a warship going abroad is different to that of a regiment going on foreign service. The one is continually on the move, while the other as soon as it arrives at a certain place stays there. One way to get over the difficulty as regards the Navy would be to have special ships for the wives of officers and men to follow up a fleet, but there are objections to such a scheme. Mr. David Hannay, writing in the *Navy and Army Illustrated* on the subject, says that the exclusion of women from ships is a compliment. "The husband, it is supposed, will not willingly incur risks when his wife is there," says he. It has long been the dream of some writers that married quarters will eventually be established at Malta, and at the home ports, but whether this dream will ever be realised is questionable. There is still some truth in the old saying that a sailor married is a sailor marred.

Russian Ships to be Built in France.

It has been said, ever since the Franco-Russian Alliance became an accomplished fact, that the advantage has been all with Russia, and that France has been merely a cat's-paw wherewith to get Russia's chestnuts out of the fire. It seems, however, that the French are to make something out of the *entente*. According to the *Morning Post*, the Russian Goverment has placed an order with the French Shipbuilding Co., at La Seine, for a battleship of 13,000 tons displacement, a cruiser of 7,800 tons displacement, and three 27-knot torpedo-boat destroyers. The Russians are to pay for these five vessels 51,000,000 fr., or about £2,040,000. It may be pointed out here that the profit that the French shipbuilders would make is quite 25 per cent. Supposing, for purposes of argument, that the battleship will cost £860,000; the cruiser, £420,000; and the three destroyers, at £70,000 apiece, £210,000; the cost of the whole five ships would be £1,490,000. This will leave a balance of £550,000, which is about the amount of profit the French shipbuilders will make, unless the sum is to include armaments, but in this case here would be a profit of something like £300,000. There is little doubt that Russia is merely allowing the French shipbuilders to build these vessels because of the friendship which is supposed to exist between the two countries. The Russian Naval authorities must know that the ships could be built much cheaper and better in this country.

Troubles of Torpedo Boats.

During the past month quite a number of our torpedo boats and torpedo-boat destroyers have been in trouble in various ways. Abroad, at Algiers, while torpedo boat No. 144 was at practice, one of her torpedoes exploded. Luckily but little damage resulted, and no loss of life, the boat being able to return to harbour without assistance. Torpedo boat No. 28, too, went ashore on the rocks in Kalk Bay near Simon's Town. She was undergoing some speed trials under the command of Lieutenant Royle, of the *Widgeon*, and struck a reef when travelling at 18 knots, tearing a hole in her bottom 6 ft. wide. She was towed to the beach, and at high tide was completely submerged. No accidents to life occurred here. At home there have also been some serious accidents, and one which occurred about ten miles off Yarmouth on the torpedo boat destroyer *Porcupine* resulted in one of her crew losing his hand. The *Porcupine* had been engaged in torpedo practice in conjunction with the *Mallard*, *Swordfish*, and *Desperate*. A torpedo had just been discharged, when its propeller caught the seaman's wrist, severing the bone and tendons. The wounded man was landed at Yarmouth and conveyed to the hospital. An accident also happened to the machinery of the torpedo-boat destroyer *Haughty* a few week ago, compelling her to return to Sheerness Harbour from where she was towed to Chatham to have her defects attended to. It may interest many to know that stoker Lynch, who received such severe injuries on the occasion of the disaster to the *Thrasher*, now lies in a precarious condition in the Royal Naval Hospital, Stonehouse. Not much hope is entertained of his recovery. At Devonport, two or three weeks ago, the torpedo destroyer *Fairy*, while being taken into Keyham Basin to have some machinery defects made good, collided with the sea wall, and seriously damaged her starboard bow. This mishap will require her to be fitted with several new starboard bow's plates. It seems that the reversing gear of the engines refused to work when order was given to go astern. A court assembled on the same day to investigate the cause of the accident.

Chatham Dockyard.

The event of the month at this yard was the visit of the Lords of the Admiralty for purposes of inspection. Mr. Goschen was accompanied by the First Sea Lord, the Controller of the Navy, Mr. Austin Chamberlain, and Mr. Macartney. Their Lordships' first duty was to inspect the stores for mercantile cruisers, after which they dealt with the work in hand at the yard, and then discussed plans for the future. A report of the vessels under construction was also submitted to their Lordships. A tour was made of the dockyard, and the two battleships and cruiser which are under construction here were inspected by them. The sites of the proposed building slip and dock were viewed by their Lordships. They also selected a site for the new naval barracks in connection with the School of Gunnery. The extension of his command to Admiral Andoe as the Admiral Superintendent was met by approval by everybody. His extension was for twelve months. Under ordinary circumstances his term of office would have expired on the second of this month. Although the *Vindictive*, to which we have referred in another paragraph, has come out of her trials so successfully, the *Pactolus* has not been so lucky. The postponement of her trials has occurred from time to time, and although the results of the preliminary trials were satisfactory, the thirty hours' run at half-power was a failure, owing to defects in her pumping machinery. These defects will have to be made good before she can resume her trials. Her gun trials have been indefinitely postponed. The refitting of the *Warspite* is being expedited as much as possible. Her breach-loaders have been replaced by quick-firers, and her machinery and boilers have undergone a thorough overhauling and repairing. Nothing has been done to the *Pylades* since she returned from the Australian station, although estimates of the cost of refitting her were forwarded to the Admiralty some time ago.

New Gunboats and Destroyers.

It is expected that the four new gunboats *Bramble* and *Britomart*, building by Potter & Co., Liverpool, and the *Dwarf* and *Thistle*, by the London and Glasgow Shipbuilding Co., Glasgow, will be sent to Devonport early next year. The only gunboats that resemble them in any way are those of the *Lapwing* type. The new boats will have a length of 180 ft., a breadth of 33 ft., and with a mean-load draught of 8 ft., and will displace 700 tons. They are to be fitted with water-tube boilers, capable of driving their triple-expansion engines at 900 I.H.P., with the natural draught, and 1,300 with the forced draught, and a speed of 13½ knots. The armament will consist of two 4 in., and four 12-pounder quick-firing guns, and two Maxim machine guns. The new gunboats are specially suited for service in rivers which it is impossible for vessels of ordinary draught to navigate. The new torpedo-boat destroyer *Albatross*, which was launched from Messrs. Thornycroft & Co.'s shipbuilding yard at Chiswick recently, completes the list of the newer type of experimental torpedo-boat destroyers built under the orders of the Admiralty. She is 327 ft. in length, 21 ft. in beam, with a speed of 32 knots, in which case she will prove the fastest ship of her kind in the world. Her armament consists of six guns, and she is fitted with triple-expansion engines and boilers of the Thornycroft water-tube pattern. She is able to develop 8,000 H.P.

Oil Fuel for Torpedo Destroyers.

Early last month, some most interesting experiments took place on board the torpedo destroyer *Surly*, when oil fuel was tried as the propelling power of the vessel. Never before has this fuel been tried in a British warship at sea. The system which is fitted up on boardthe *Surly* was invented by Mr. Holden, of the Great Eastern Railway, and the trial took place with the special permission of the Admiralty. Mr. Holden's invention was adapted to only two of the *Surly's* boilers, of which there are four. From the descriptions which have been given, it appears that coal fires are in the first place lighted in the furnaces. No sooner has sufficient heat been generated, than bricks are placed in the furnaces to take the place of the coal, and the oil is sprinkled on them from an overhead tank, in this way overcoming the difficulty which has sometimes previously been experienced in furnishing a regular and sufficient supply of the oil. The trial was made over the mile in Stokes Bay, and appears to have been fairly successful, the spray being quite sufficient to obtain the heat required. The thermometer in the stokehole indicated 150 deg. F. at one time. The results would seem to be quite encouraging enough to induce the authorities to go on with the experiment. Although it was hoped that a speed of 16 knots would be obtained, the average for three runs over the mile was 14 knots. The petroleum refuse, which is used to sprinkle on the bricks in the furnaces, has a flash point of 280 deg. F.

Pembroke Dockyard.

The affairs of this yard go along smoothly. The *Andromeda*, *Spartiate*, and the Royal Yacht, all continue to make good progress. A large number of shipwrights, fitters, joiners, smiths, coppersmiths, painters and labourers, have recently been added to the staff here, and the total number of hands now at work in the yard is more than 2,600. Great efforts have been made to get the *Andromeda* advanced as far as possible before she leaves for Portsmouth. Work on the *Spartiate* has been somewhat retarded on account of there not being sufficient hands put to work on her and the same may be said of the Royal Yacht. When the *Spartiate* is launched a new armoured cruiser is to be laid down on the slip which she vacates, and it was the intention of the Admiralty to spend more than a quarter of a million upon this new cruiser before the end of the present financial year. Instructions from the Admiralty regarding the new Royal Yacht state that when she is launched, the vessel must be in a fairly advanced condition in her upper fittings and otherwise, that she may be easily recognised as a yacht. She is to be fitted with a new style of coaling port, in order that her bunkers may be filled from the sides instead of first bringing the coal on deck. A model of the dome for her saloon has been submitted to the Admiralty. Most probably a member of the Royal Family will officiate at the launch.

Sheerness Dockyard.

The visit of the Lords of the Admiralty to this yard took place a week or so ago. Their Lordships inspected the Naval Establishments, and made a tour of the Naval Barracks, in which, at present, there are about 900 petty officers and men attached to the Sheerness School of Gunnery. They also visited the pigeon loft, and apparently were greatly interested in the work of training pigeons for naval service, which work has been going on at Sheerness Dockyard for some two years past. The next place to receive the attention of their Lordships was the Chief Engineer's Department, after which they made a tour of the docks and basins and viewed the cruisers *Proserpine* and *Pomone*, the sloop *Buzzard* and gunboat *Speedy*, and the new sloops *Condor* and *Rosario*. No very important questions were brought before their Lordships. Good progress continues to be made with the sloops *Condor* and *Rosario*, and it is expected that they will be floated out in less than two months time. The machinery of the *Rosario* was made at Devonport Dockyard, and will be fitted on board by the chief engineering staff of this yard. The *Rosario* is to be completed for sea by March next, which is *four* months earlier than the date mentioned in the current year's programme of work. Her machinery is to cost about £50,000, and it has taken about six months to construct it. The machinery of the *Condor* was supplied by the Thames Shipbuilding Co. It is expected that the *Proserpine* will be transferred to the Fleet Reserve before the end of this month. Her machinery has been opened up, and her engines appear to have stood the test of her recent trials well.

TRIPLE-EXPANSION ENGINES FOR S.S. "COUNTESS OF BREADALBANE."

THE problems which have not infrequently to be solved, and the skill which is brought to bear on their solution, are as notable—some may even think more notable—in connection with small marine engines as with more ponderous ones. This is, of course, at once acknowledged in cases where high speed and unusual lightness are the regulating, and often dualistic, conditions to be fulfilled. Even in cases where these conditions are not very prominent the designing and building of small engines are matters calling for the exercise of similar skill and care, and are well worthy of notice.

We have described and illustrated many such engines in past numbers, and we have pleasure in the present issue in illustrating a set which our Scottish representative had the privilege of personally inspecting on one of his periodical visits to Leith. These engines, illustrated on pages 234 and 235, were produced by the firm of Messrs. Hawthorns & Co., of Leith Engine Works, and are fitted into the smart little screw steamer *Countess of Breadalbane*, plying on the far-famed Loch Awe, between Loch Awe Hotel and pier, at the head of the lake, and Ford at its foot, about 30 miles distant.

The new engines, which take the place of old ones on the compound principle, with which the "Countess" was originally provided, are of the triple-expansion, three-cylinder, three-crank, direct-acting, surface-condensing type, using steam at a pressure of 180 lb. per square inch. The cylinders are 9 in., 15 in., and 22 in. diameter, having a stroke of 15 in., the pistons having patent metallic packing rings. The cylinders are carried on cast-iron standards of the box type, except the high pressure cylinder, which is supported by a wrought-iron column at front, next starting platform. The high pressure cylinder has a piston valve, and the intermediate and low-pressure cylinders ordinary double-ported slide valves, all balanced and arranged for variable expansion. The piston-rods and crossheads are of the best mild steel, and the connecting rods of the best scrap iron.

The crank shaft, of the "built" type, is of the best selected scrap iron, the crank pins being of steel. The crank shaft bearings have heavy gun-metal bushes, and the after bearing serves as the thrust bearing. The propeller shafting is 4½ in. in diameter, and the propeller is of Parson's Manganese Bronze, three-bladed, and 5 ft: 2 in. diameter.

Worked by levers from the crossheads of the main engines there is an air-pump, feed-pump, bilge-pump, and circulating pumps. There is also a donkey-pump of the duplex type, all of first-class make.

The boiler, supplying steam at 180 lbs. pressure, is single-ended, 8 ft. 3 ins. diameter by 8 ft. long, the shell being in two plates only. There are two furnaces of the corrugated type, 30 in. mean diameter, with separate combustion chamber to each, and fitted with Martin's patent fire-doors. The boiler tubes are 2½ in. diameter, swelled ½ inch at smoke box end. The gauge glass columns and cocks are of Dewrance's make, and the safety valves of Cockburn's patent.

The engines and boilers, while designed and built by Messrs. Hawthorne & Co., had the benefit of the supervision of Mr. Richard Young, superintendent engineer of the well-known London and Edinburgh Shipping Co.'s fleet, whose services and experienced skill the owners of the *Countess of Breadalbane* are to be congratulated on having retained for this purpose.

The *Countess of Breadalbane*, when put on trial on her station early this season, attained close on 14 knots, the power developed by her engines being close on 240 I.H.P. Her performances since, in plying to-and-fro over the charming waters of Loch Awe, have given great satisfaction to the owners and the general public alike.

TROON DOCKS AND SHIPYARD.

AN important acquisition to the existing facilities for the docking and repair of vessels on the Ayrshire coast will shortly be made in the new graving dock which for the past year and a half has been under construction at Troon. To complete the dock there only remains some concrete work at its head, after which, and the removal of the retaining material and coffeedam at its mouth, the dock will be formally opened and available for duty. It is 360 ft. in extreme length, 50 ft. in width at bottom, 86 ft. at top, and 30 ft. depth from cope to floor. The width at entrance is 48 ft. both at sill and cope, and there will be 16½ ft. of water on the sill at high-water of ordinary spring tides. The dock is thus of dimensions suitable for accommodating vessels of the largest size likely to frequent the port, and may even accommodate two vessels of the class usually trading with Troon and other Ayrshire ports.

Two dry docks of much smaller dimensions, and not capable of admitting vessels drawing more than 10 ft. of water, have hitherto been in use at the port, but one of these, which was contiguous to the site of the new dock, has been filled up, and the ground thus recovered is being added to the yard of the Ailsa Shipbuilding Co., which is close alongside. Both the new and the remaining old dock will be embraced in the shipyard area as extended, and will be worked exclusively by the company. The extended area will enable the launching berths of the shipyard to be increased to five, and also afford additional space for the storage of material, &c.

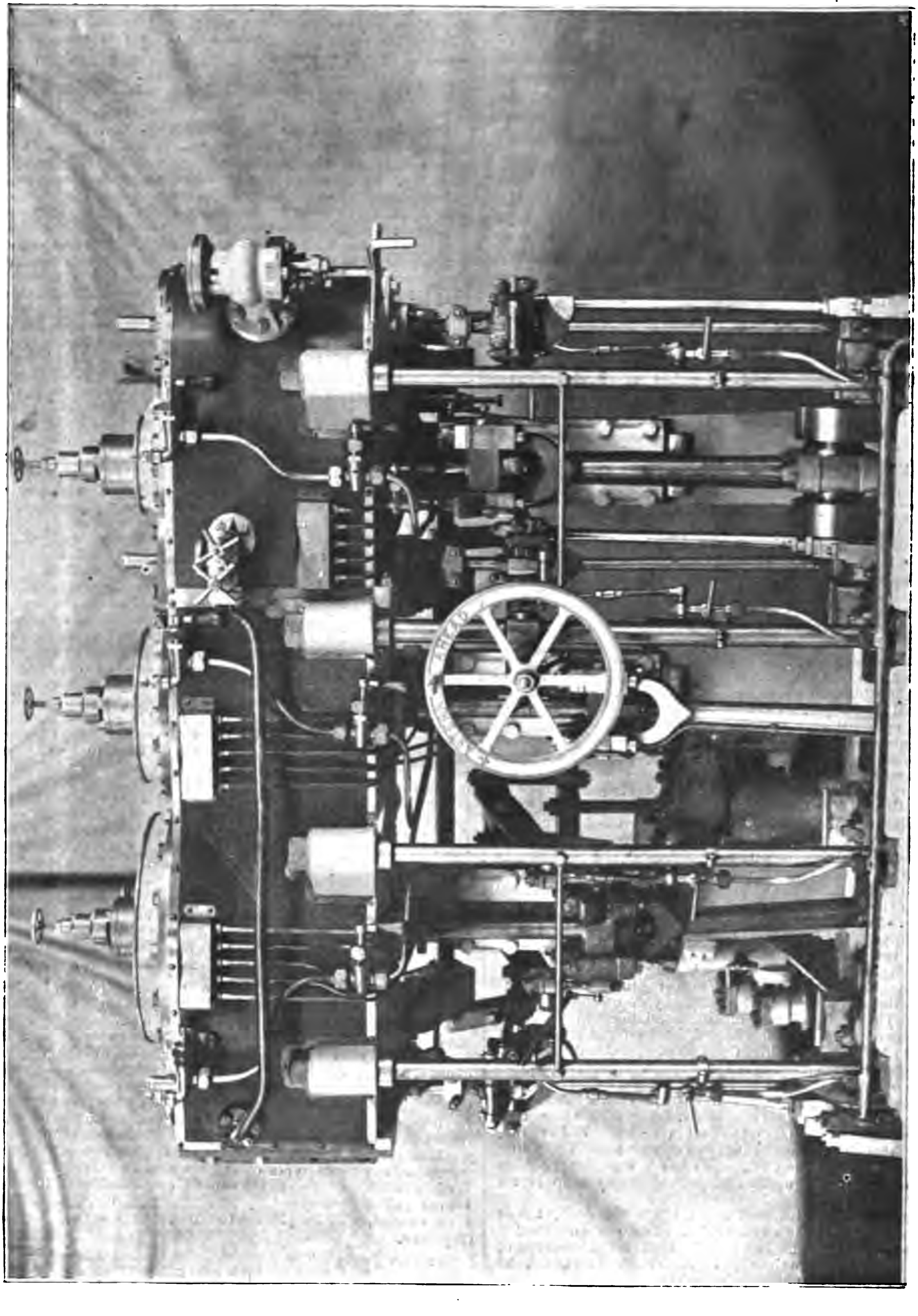
Between the new dock and the remaining old dock, which lies beyond the building berths, a culvert is being tunnelled, and it is intended that both docks will be worked by the one pumping installation. The machinery forming the installation, which consists of two sets of powerful "Bon Accord" centrifugal pumps and engines by Messrs. Drysdale & Co., Glasgow, is situated close to the entrance of the new dock and is already in place. The engines which have hitherto driven the pumps at the old dock will now be available for driving the saw-mill plant of the Ailsa Co. The dock and other work referred to entails some considerable outlay of capital on the part of the Duke of Portland, who is harbour superior, but it gives every promise of resulting in enhanced trade to the port, as well as of enabling the Ailsa Co. to undertake more than at present heavy ship repair work.

In connection with the construction of the new dock, it is of interest to state that the whole dock has been cut and blasted out of the solid rock, and but for the unexpected presence of strata of a softer nature than its superincumbent material, the dock would have been finished simply as hewn out of the native rock. As it is, the body of dock, attar courses, &c., have been finished off with a thick facing of concrete. All the granite employed on dock sill and entrance walls has come from Cornwall. The dock gates are of yellow pine and greenheart. The contractor for all the work of dock construction is Mr. George Lawson, of Rutherglen.

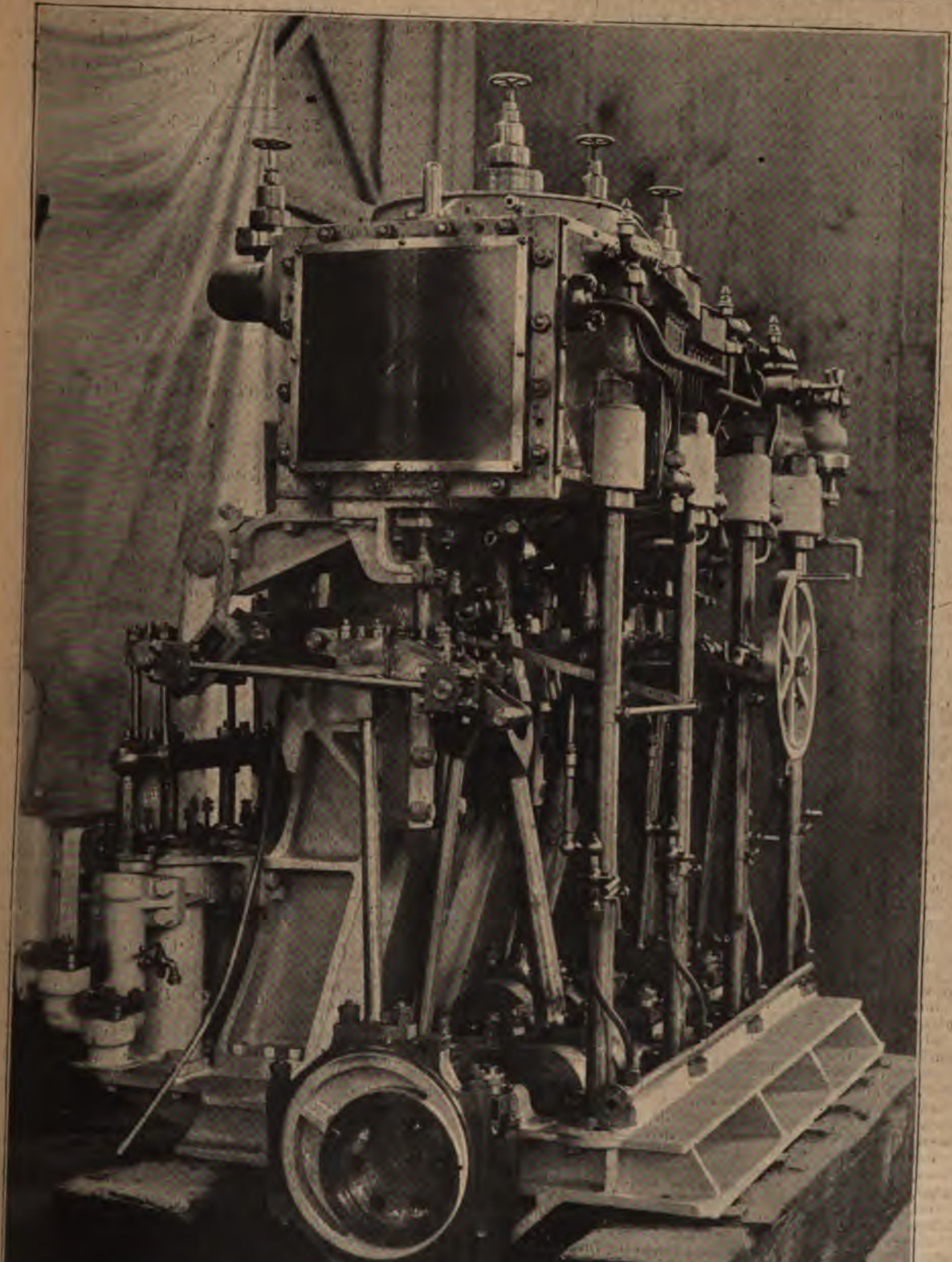
The Anglo-American Boiler Solvent Co., Runcorn.—Messrs. Rowland G. Foot & Co., have been appointed sole agents for the Anglo-American Boiler Solvent Co., Runcorn, for the district of London and the South. This company was formed in the year 1885, their specialities being their Zenith Boiler Fluid (Zincate of Soda), Condenser Cleansing Solution, and Eucalene Disinfecting and Sanitary Cleanser. At the Liverpool International Exhibition in the year 1886 they received the only prize medal awarded for the excellence of their boiler fluid, &c., and later in the year 1895 they were again awarded the only prize medal for this class at the British and Colonial Exhibition, Manchester, which award brought the company into prominence. They have always made a point to secure samples of boiler feed water, which are analysed with great care, and the boiler fluid made up to suit the different kinds of water, whether it be a hard colourous water from the red sandstone or chalky beds, ochery or ferruginous water out of the coal or iron measures or water impregnated with magnesium salts, which latter-named element always has a tendency to make the scale very hard and difficult to remove. Too much cannot be said as to the efficacy of their condenser cleansing solution, as when it is used there is not the slightest occasion for the removal of a single tube out of the condenser—the labour saving and economy of material must be obvious, but the most important part of the whole business is the expedition with which the condenser is cleaned, being a great saving of time and material over the old method of "acid bath" and the great advantages gained by increased vacuum in the warm waters of the Mediterranean and Red Seas as well as in the tropics. Reporting on its action one expert explains that, as is well known, the contact with the hot tubes decomposes any greasy matter in the water, and the fatty acids then gradually corrode the tubes, finally producing insoluble metallic soaps. The cleansing solution anticipates this difficulty by forming a soluble soap with any greasy matters, which is easily washed and steamed out. Further than this it decomposes any metallic soap present and effects its subsequent removal, leaving the coating surfaces clean and in a more efficient state. The third speciality they vend is Eucalene Disinfecting and Sanitary Cleanser which is used in public institutions in preventing the development of bacillus and spores, the bacteria resulting from putrefaction. It has a greater affinity for grease than a great many soaps and does away with the use of the "holystone" used for scrubbing the decks, as when this is used the decks are made beautifully white, and this property combined with its strong disinfectant power renders it a very efficient agent on shipboard and in sick-rooms for sanitary and cleaning purposes. It also acts as a vermicide, destroying those parasitic forms of insect life which are so troublesome on the Continent and in the Tropics. In the use of it it has a very agreeable and pleasant odour.

Messrs. Holden & Brooke have sent us a copy of their new catalogue of the "Sirius" Exhaust Steam Injectors. This includes particulars of injectors for use with any usual pressure, together with steam fittings for use in connection therewith. In addition to the usual trade description of the various devices, a considerable amount of useful information is given, tables showing relative sizes and duties being included so as to enable an intending buyer to readily decide on what he requires under a given set of circumstances, particularly with regard to the utilization of waste steam. A number of interesting illustrations are given showing the applications of exhaust injectors to various types of engines and to other purposes. We have been requested to state that Messrs. Holden & Brooke, Limited, whose works are situated in Clowes Street, Hyde Road, West Gorton, will be pleased to send catalogues post free to enquirers.

Torpedo Boats.—The Japanese Government have placed an order for five first-class torpedo-boats (*Viper* type) with Messrs. Yarrow & Co., of Poplar.



Triple-Expansion Engines, Constructed by Messrs. Hawthorn & Co., Limited, Leith.



TRIPLE-EXPANSION ENGINES, CONSTRUCTED BY MESSRS. HAWTHORN & CO., LIMITED, LEITH.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from June 25th to July 23rd, 1898:—

Meervy, Charles de F. (probationary), assistant engineer to the *Benbow*, to date July 5th.
Mew, W. H. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Michell, William H., fleet engineer to the *Vivid*, for the *Edgar*, to date July 18th.
Misselbrook, S. G. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Mitchell, James, artificer engineer to the *Fearless*, to date June 28th.
Mitchell, W. H. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Murphy, John, acting engineer to the *Howe*.
Nicholson, J. B. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Nye, A. J., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's fleet.
Parnall, Walter R. (probationary), assistant engineer to the *Rodney*, to date July 5th.
Peacock, David, chief engineer to the *Vivid*, additional, for the *Sheldrake*, to date July 2nd.
Pearce, R. S. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Peel, Henry C.W., chief engineer to the *Sphinx*, to date June 30th.
Pibiworth, William H., fleet engineer to the *Victory*, for the *Glatton*, to date July 19th.
Picton, A. L. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Pollard, P. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Portch, H. W. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Procter, Thomas G. (probationary), assistant engineer to the *Collingwood*, for service during summer cruise, to date July 5th
Read, Walter S. (probationary), assistant engineer to the *Colossus*.
Rock, S. J., fleet engineer, has been placed on the Retired List, with permission to assume the rank of inspector of machinery.
Roffey, James R., engineer to the *Victory*, additional for gunboats at Haslar, to date July 2nd.
Rosevere, William H. (probationary), assistant engineer to the *Colossus*, to date July 5th.
Sargent, J. J. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Shaw, J. F. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.
Shillcock, A. E. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Sillince, William P., assistant engineer to the *Rodney*.
Simpson, James M., engineer to the *Vivid*, for the *Antelope*, to date July 18th.
Stansmore, Henry C., fleet engineer to the *Victory*, for the *Minotaur*, to date July 19th.
Stuart, Marlin, chief engineer to the *Vivid*, additional, for charge of torpedo boats, to date July 22nd.
Sutton, Arthur W., assistant engineer to the *Victory*, supernumerary, to date June 24th.
Talbot, J. C. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Thorne, Thomas, staff engineer to the *Nile*, to date June 28th.
Toman, Richard W., engineer to the *Revenge* for the *Foam*, to date July 15th.
Turner, E. H., gent., to be assistant engineer, R.N.R.
Vining, Henry P., chief engineer to the *Vivid* for the *Rainbow*, undated.
Walker, J. S. (probationary), assistant engineer to the *Pembroke*, supernumerary, to date July 1st.
Wallace, Charles J. M., assistant engineer to the *Benbow*.
Ward, John T. H., engineer to the *Hibernia*, for the *Boxer*, to date July 15th.
White, Alfred J. (probationary), assistant engineer to the *Australia*.
White, G. H., (probationary), assistant engineer to the *Vivid*, to date July 1st.
Wickham, Harry J. (probationary), assistant engineer to the *Galatea*, to date July 5th.
Wolfe, H. E. (probationary), assistant engineer to the *Victory*, supernumerary, to date July 1st.
Woodhouse, G. W. (probationary), assistant engineer to the *Vivid*, supernumerary, to date July 1st.

From July 25th to August 25th, 1898:—

Baron, Roger, engineer to the *Jupiter*, to date August 8th.
Barron, Roger, engineer to the *Victory*, supernumerary, to date July 22nd.
Bell, H. F.*
Cook, Alfred E. (probationary), assistant engineer to the *Victory*, for the *Andromeda*, to date August 1st.
Cox, Herbert B., engineer to the *Victory*, for the *Bullfinch*, to date July 27th.
Cook, William, fleet engineer to the *Victory*, for the *Spartiate*, undated.
Daves, Henry F., engineer to the *Vivid*, additional, for the *Leopard*, to date August 2nd.
Denbow, William, engineer to the *Vivid*, for the *Sunfish*, undated.
Dewhurst, C.*
Edwards, Walter, engineer to the *Hood*, for the *Bruiser*, to date July 28th.
Evans, H.*
Fawckner, S. M. O.*
Figgins, J. W.*
Guyer, Thomas S., engineer to the *Centurion*, supernumerary, to date August 2nd.
Hardwick, William W., engineer to the *Vivid*, additional, for the *Blake*, undated.
Hewett, J. B.*
Howe, P. C. W.*
Howell, L.*
Irish, Herbert W., engineer to the *Victory*, for the *Lightning*, to date July 28th.
Jeffery, Richard G. (probationary), assistant engineer to the *Hawke*, to date July 28th.
Kelly, J., assistant engineer to the *Vivid*, to date August 9th.
Kent, Walter J., engineer to the *Vivid*, for the *Thrasher*, undated.
Lamb, F. E.*
Laughton, Charles, engineer to the *Royalist*, to date July 27th.
Lecky, Charles B., engineer to the *Vivid*, additional, undated.
Legate, J.*
Little, J. A.*
Liversidge, Henry T., engineer to the *Pembroke*, additional, to date August 22nd.
Liversedge, John G., engineer, has been promoted to be chief engineer, with seniority of July 1st.
Liversidge, John G., chief engineer to the *President*, additional, as Instructor of Applied Mechanics at R.N. College, to date July 1st.
Main, Frank, engineer to the *Victory*, additional, for the *Flirt*, undated.
Mallinson, Ernest D., engineer to the *Victory*, supernumerary, to date August 9th.
Markham, R. G. L.*
Michell, John L., staff engineer to the *Pembroke*, for the *Superb*, to date August 22nd.
Palmer, Alfred, fleet engineer to the *Victory*, for the *Nelson*, undated.
Parrott, Jasper, W. A., engineer to the *Pembroke*, to date Aug. 8th.
Priston, Robert B., fleet engineer to the *Pembroke*, for the *Goliath*, to date August 22nd.
Rosevere, E. J., engineer to the *Assaye*, to date August 9th.
Saunders, A.*
Shorey, E., engineer, has been promoted to the rank of chief engineer in Her Majesty's fleet.
Shorey, Charles, E., chief engineer to the *Alexandra*, additional, for the *Spanker*, re appointed on promotion, to date July 9th.
Short, Edward, A., chief engineer to the *Vivid*, additional, for the *Sharpshooter*, undated.
Stearn, Walter T., engineer to the *Pembroke*, additional, for the *Angler*, to date August 8th.
Stephens, L. J., engineer to the *Magdala*, additional, for the *Plassy*, to date August 9th.
Stevens, John G., staff engineer to the *Victory*, for the *Crescent*, undated.

Sutton, A. W.*

Toman, Richard W., engineer to the *Hibernia*, additional, undated.

Underhill, A. M.*

Vining, Henry P., chief engineer to the *Rainbow*, to date August 3rd.

Webb, Arthur T., engineer, has been promoted to be acting chief engineer, with seniority of July 9th.

Webb, Arthur T., acting chief engineer to the *Melampus*, to date July 9th.

* Assistant engineer, has been promoted to the rank of engineer in Her Majesty's fleet.

HOAR & BROWN'S HARDWOOD MARKET REPORT, AUGUST 24th. 1898.

Teak.—*Logs.*—A slight decrease in arrivals is noticeable. The deliveries have fallen off, compared with the same month last year, to the extent of some 200 loads. Business has shown its usual dulness for the holiday season, but brighter prospects are in view owing to the promised revival in shipbuilding both at home and abroad, and for some time to come there is little prospect of prices receding. The appearance of the store sheds at the West India Docks is somewhat changed of late by open spaces of ground being visible in many of the sheds, and this may continue during the remainder of the year, as the floating consignments destined for London are expected to be unusually light. The Dock Co. are preparing increased storage room, which will no doubt become useful during next year, when arrivals must be numerous to satisfy the expected large demand. The present stock of some 9,500 loads may be considered light, especially as further large deliveries are about to take place during the next few weeks. Prospects therefore appear favourable for holders.

Teak Planks.—The stock continues heavy, there being over 3,000 loads now piled away in docks. Very little of this quantity, however, remains in first hands. Prices continue firm, and shippers are threatening a still further advance in values for good specifications. Short, narrow planks remain cheap, and are becoming more or less a drug in the market, as requirements for these sizes have not been taken from the home stocks, and prices for this class, which is represented largely in the present 3,000 loads, may be likely to droop. Specifications holding good lengths and fair widths, such as 16 ft., 12 ft. by 4 ft., will continue to advance, the demand being good.

Mahogany.—The small supplies of late have given a better tone, which was shown upon the occasion of a large without reserve sale just held at Winchester House, when about 300,000 ft. of second-hand goods met with a ready response among merchants and consumers, the prices at which the respective lots were knocked down being considered exceptionally good for the class of wood.

Honduras.—The stocks are small, especially for prime straight sizeable logs, and the steamer arrival just to hand does not present any large quantity of the required sort, so that prices are likely to be very firm for first-class goods.

Tobasco.—There has been no striking demand lately, and dealers high-priced stocks have suffered considerably from the hot weather, in some cases reducing values from 25 to 50 per cent.

Minatitlan.—This wood generally leaves a loss for holders and it is not surprising that shipments have been much reduced of late. As a matter of fact the market could do very well without any further arrivals.

Tecolusta.—The condition of these shipments prevents any first-class dealing, and only minimum buyers are usually found purchasing these stocks. Some good logs found in a cargo are generally sold much below their value. The wood is of first-class quality, and if the conversion and condition were in any way up to the usual standard there would be a considerable demand for Tecolusta shipments.

Panama.—It is reported that importers stocks have been cleared; the price does not transpire, but most of the timber has been on hand a considerable time. Sound logs have been selling readily, and at good prices.

African.—The stocks here are mostly of a very inferior quality, as may be calculated from the very low figure obtained at the last W. R. Auction, the old prices of 1½d. and 1¾d. showing themselves again; it was considered we had seen the last of these ruinous values. Good Axim wood holds its own fairly well, but anything shaky or faulty is allowed to fetch minimum prices.

Cuba and Spanish.—The former has not been enquired for to any extent, owing no doubt to the high prices. The stock is very light, being considerably under 1,000 logs. At the last auction every lot was greedily snatched, and mostly fell to consumers, the few purchased by dealers almost immediately changed hands. Of Spanish the stock is almost nil, but there is no pressing demand, and other mahoganies appear to be used in its place.

Cedar.—The stocks of Honduras, Tobasco, and Cuba are very light, the only full market is in Paraguay, constituting more than double the other three, but the Paraguay finds little favour in the London market, except when offered below mahogany minimum. Good boat-building logs are much required, also panel wood. Prices are ruling high for good qualities of each.

Sequoia.—A small stock has been worked upon for some months, and the price of 2s. 3d. appears to be a fixed rate. No further cargoes are expected just immediately.

Kawrie Pine Planks.—Enquiries are not very numerous, there is plenty of stock to go on with, and prices remain firm at the old figures. Logs are slow of sale.

Jarrah.—There is a good market for spot goods and for forward delivery at the old figures. The difficulty of obtaining freight at a reasonable rate has prevented business to any extent. Cargoes arriving lately under contract have suffered under the enforced rates.

Walnut Wood Logs.—Sales are very moderate, and the poor wood especially remains low with difficulty in placing; good prices have been paid for large and sound logs for knife purposes. Planks and boards of the inferior grade are also difficult of sale, and only the prime wood is realizing renumerative figures.

Whitewood Boards and Planks are commanding a good business; the low overside prices are tempting to consumers, and assist in making larger sales than usual.

Greenheart.—Enquiries have totally fallen off; only one cargo of small size comprise the major portion of stock here, the price asked is unusually low, being below £6 per load.

Taking everything into consideration, including the excessive heat combined with the holidays, there has been very little slack time, and the amount of business transacted has been fully up to the average.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

WITH work so plentiful and the workmen admittedly anxious to recoup themselves for their recent losses, it was hoped that the resumption of labour in the Clyde engine shops and shipyards, after the annual Fair holidays, would be both prompt and universal. It proved to be, however, like the start at all other periods, partial and gradual, and it was well on into the first week in July before anything like the customary briskness had been attained. For five weeks or so, however, all the large engineering, shipbuilding and iron and steel works have now been in full swing, and the pressure for delivery of material is on all hands said to be even greater than it was before the holidays. Double shifts are common in these departments, but especially in that of steel, makers of which were never so busy. Another advance of 2s. 6d. a ton was made at the beginning of July in ship-plates and angles, which are now quoted £6 5s., and £6 respectively; boiler plates £6 10s. There are advances of 20s. a ton on the prices of last year and are the best quotations which the trade have realized for years. Order books all round are well filled, inquiries are still on a liberal scale, and the outlook for the next twelve months is such as probably was never before witnessed in the industrial position of the West of Scotland.

Regarding the outlook in the Scottish centres, as in others, the last monthly report of the United Society of Iron and Steel Shipbuilders is, to say the least, very cheerful. Mr. Knight says:—"The prospect is certainly bright, and trade is better now than it has been for a considerable number of years. There are indications of plenty of fresh orders coming forward. In the whole of the shipbuilding districts of Scotland there has been an advance of wages of 5 per cent. on piece rates and 2s. per week on time. Boiler shops connected with the same districts have also received an advance of 5 per cent. on piece, and 2s. 3d. per week on time rates."

There is still, however, one "fly in the ointment" in the shape of an agitation for weekly instead of fortnightly pay. An informal conference on this subject took place during the month between representatives of the Shipbuilding Trades Federation, and of the Employers Federation. Beyond a general talk over the position nothing was done, but it was arranged that a joint conference shall be held during the ensuing month on a date to be arranged.

The Clydebank Engineering and Shipbuilding Co., Limited, early in the month secured the contract for one of the two first-class cruisers recently tendered for. The vessels are to be an improvement on the *Cressy* class, and are to have a speed of 21 knots. The same company has secured the order for a huge "intermediate" or cargo steamer for the Cunard Co. The new vessel is to be 580 ft. in length, and of about 12,000 tons gross measurement. Rumour has it that the Clydebank Co. has been commissioned to build and engine a fast and powerful cruiser for the Japanese Government, but this requires confirmation.

The same remark also applies to the announcement, made on the authority of one of the Glasgow dailies, that Messrs. Denny & Bros., Dumbarton, has recently booked an order for three new cargo steamers of 8,000 tons each for the British Steam Navigation Co., and that orders for four new steamers for the Union Steamship Co. of New Zealand—for which company Messrs. Denny have supplied almost the total fleet—would shortly be placed.

Speaking of Messrs. Denny Bros. it is of interest to state that Mr. Leslie Denny, the youngest member of the firm, has recently entered upon the sea of matrimony. At a supper given on the occasion of the marriage to the foremen and officials of the Leven Shipyard, Mr. Archibald Denny waxed statistical, and said that the firm "had now got an order for their 616th vessel. He joined the firm in 1883, and they were then building their 263rd vessel. In fifteen years they had turned out 358 vessels, an average of ·4 of a vessel per week." At Dumbarton of course, they are nothing if not scientific and "point" or "decimal four of a vessel" is no doubt easily "understanded of the multitude" there. It will not, however, lessen the impression on our readers to be told that the average so pointedly referred to means very nearly 21 vessels per annum! Many of these, of course, were barges and other light-draught craft, shipped abroad in pieces, but the achievement is noteworthy notwithstanding.

Messrs. Taylor & Mitchell, the new shipbuilding firm, who have organised a shipyard to the east of the James Watt Dock, Greenock, and who have already one order on hand, have contracted to build a steel screw steamer for Mr. J. M'Causland, Portaferry, Belfast. This vessel is intended for cargo and salvage purposes, and will be strongly constructed and furnished with all the latest appliances.

The Irvine Shipbuilding and Engineering Co., Limited, have contracted with Messrs. J. & P. Hutchison, of Glasgow, to build a cargo steamer of 800 tons carrying capacity for their general coasting trade. The new steamer will be similar in equipment to the s.s. *Hector*, recently completed by the Irvine firm for the same owners.

Messrs. John Scott & Co., of Abden Works, Kinghorn, on the Fifeshire coast, have been commissioned to build two new steamers to replace the *Tantallon Castle* and the *Stirling Castle*, two of the finest of the fleet of paddle steamers with which the Galloway Steam Packet Co., of Leith, carry on the passenger and tourist service on the Firth of Forth. The new vessels, in respect to size and equipment, will be an advance upon those recently sold, and will be lit by electricity throughout. Messrs. Scott & Co. have turned out a larger number of fair sized vessels this year than at any previous time, a noteworthy feature connected with their productions being that all the vessels are sent off the stocks with steam up and ready to undergo their speed trials. The most recent of the vessels thus launched was the *Macona*, a high-class steam yacht of 635 tons, the event being witnessed by about 5,000 spectators.

The Dundee shipbuilders' Co., Limited, received early in the month the order to build three steam trawlers for Grimsby owners. The vessels are to be constructed on lines somewhat similar to those recently built by the company. Two of them are to be 120 ft. long and 22 ft. broad and 12 ft. in depth, while the third is to have the same breadth and depth, but will be 125 ft. long.

Lloyd's Visiting Committee, who, during the whole of the second week week in August inspected the shipyards and engineering works of the Tyne, the Wear, the Tees, and the Hartlepools, arrived in Glasgow on Monday, the 15th, and next day commenced their circuit of inspection throughout the Clyde district, this being their first visit to this important centre since 1895. The party included Mr. W. H. Tindall, chairman; Mr. J. E. Street, deputy-chairman; Mr. B. Martell, chief surveyor; Mr. J. T. Milton, engineer surveyor; Mr. H J. Cornish, assistant to chief surveyor; and Mr. A. G. Dryhurst, secretary. Besides representatives from Newcastle, Liverpool, and other ports, the members of committee coming to Glasgow included Messrs. Angier, Bromage, Fenwick and Saunders (London), Mark Whitsworth (Bristol), T. E. Watson (Newport), and Messrs. Robert Low and W. J. Pirrie (Belfast). Accompanied by Mr. T. C. Guthrie (Glasgow), D. McDougall (Greenock), Charles Barrie (Dundee), Mr. T. J. Todd, Mr. James Mollison, and others of the Glasgow staff of the Registry. The party devoted the whole of the third week and part of the fourth to visiting the yards and engine shops on the Clyde, the only steel works visited being that of Barrhead. The shipbuilding ports on the Ayrshire coast on this occasion, and for the first time, came in for a share of attention. These comprise the Ailsa Co.'s shipyard at Troon, the shipyard of Messrs. McKnight & Co., Ayr, and the works of the Irvine Shipbuilding and Engineering Co., Irvine. At Troon a feature of attraction was the new graving dock, cut out of the solid rock, which has been under formation about two years and which will be opened for traffic in about a month's time. It will be included eventually in the extension of the Ailsa Co.'s yard, and will be under the exclusive control of that company. The extension in question, besides embracing the new dock, will give the Ailsa Co. two more building berths, making five in all. In the Clyde district, apart from the great number, size, and variety of vessels on hand, there was little of any great novelty brought under notice.

In this connection it is worthy of mention, that while at Messrs. Short Brothers shipyard at Pallion, Sunderland, the Visiting Committee were shown a patent machine for joggling the frames of ships so as to enable all the plating of the shell to lie close to the frames without any packing pieces, thus saving weight throughout the ship, and enabling most satisfactory work to be accomplished. All the vessels built in future at this yard will be constructed with joggled frames and plating arranged clincher fashion. This, of course, differs from the system introduced by Messrs. Doxford, of Sunderland, and now pretty extensively adopted, of joggling the plating edges and leaving the frames straight as at present. A system of joggling the frames has also been adopted to some extent in the yard of Messrs. Russell & Co., Port-Glasgow. The committee have thus been enabled to compare the developments of this new departure in shipbuilding practice, as exemplified in the North-East coast and in the Clyde district.

At the August monthly meeting of the Clyde Navigation Trustees, which was held in the Trusts Chambers, Glasgow, on August 2nd, Lord Provost Richmond presiding, the minutes of the Law and Parliamentary Bills Committee relating to the decision of the House of Lords regarding the Renfrew Dock Bill were approved, and a vote of thanks was accorded to the witnesses and officials of the trust who had wrought hard to have the Bill thrown out. It was reported that the revenue had reached the record figure of £430,326, which gave an increase of £20,136 as compared with the previous year; and this in face of the fact that reductions in rates amounting in all to £18,000 a year had been made. The receipts of the Trust for 1896-97, when the reductions were only partially in operation, came to the record amount of £410,190, but it was a matter of some doubt whether the revenue would prove elastic enough during 1897-98 to bear the burden of still larger abatements. As seen from the above, however, the revenue has exceeded that of the previous year by as much as £20,136. The surplus for the year cannot be declared until all the accounts have been examined, but as it amounted in 1896-97 to more than £40,000, there is every reason to expect that it will now be close on £50,000. For the next twelve months just entered upon, 1898-99, the prospects are good, the receipts for July having been £1,244 beyond those of the corresponding month last year.

These gratifying tokens of prosperity, taken together with the victory achieved over the promoters of the Renfrew Dock Bill, might be thought enough to engender a highly contented or "rest and be thankful" spirit in the Clyde trustees, but this is far otherwise, and at a meeting of the committee of management on the same day it was resolved to appoint a committee to consider the whole question of harbour accommodation, and especially as to whether an additional dock should be provided at Glasgow in view of the increased demands that are being made on the harbour through the increasing trade which is finding its way into the river. The Trust in thus seeking to profit from the lessons which were to be drawn from the recent Parliamentary conflict are only following the policy of "restless progress" which has always characterised this body. The Trust it is understood have in view the utilising to the best advantage, for a dock and ample quayage and sidings, of a large track of land they own at Shieldhall on the south side of the river, about 1½ miles below the recently opened Prince's Dock.

The Greenock Harbour Trust also held their monthly meeting on the 3rd ult., and through Provost Erskine and Mr. Brown, deputy chairman, expressed great satisfaction at the rejection of the Renfrew Dock Bill. The trustees, according to Mr. Brown, look for the greatest advantage to accrue to their trust, and to the town from having been able to work harmoniously with the Clyde Trust in opposing all attempts by outsiders to get docks within the jurisdiction of the Clyde Trust. It might be hoped that one result would be the devising of some joint scheme of attending to the wants of the Clyde which would be fair to all parties.

Apropos of the subject of minimum net tonnage relatively to gross register, a subject which Mr. A. G. Ramage, shipbuilder of Leith, brought up before the last monthly meeting of the Institution of Naval Architects, and to which the members gave considerable attention, it is of interest to chronicle that there was recently handed over to her owners in Glasgow by shipbuilders on the Clyde, a cargo-carrying steamer which is exceptionally noteworthy as regards the lowness of her net register. The vessel in question is to be employed on short continental runs, entailing frequent calls in port, thus rendering a low net tonnage specially advantageous. She carries 650 tons deadweight on Lloyd's freeboard, and her gross register tonnage is 507. From three-fourths to one-half the gross, forms the usual proportion for the net register tonnage of cargo vessels. In this case, however, the net figure is but 78—in other words, is less than one-sixth of the gross; while it is also only 12 per cent. of the deadweight carrying capability. Thus for every 100 tons of carrying capability, which this remarkable craft possesses, there is only a matter of 12 tons assessable for dues, not a bad source of economy so far as such things are possible nowadays!

In spite of the experience with the water-tube type of boiler gained by the Admiralty and the progress made with its adoption in vessels of the Navy, another department of State—the Board of Trade—persist in regarding the water-tube boiler with a degree of caution that must be said to be extreme. Still, the makers of such boilers and the shipowners who would willingly adopt them if "the Board" was less conservative, are making headway, thanks to the enterprise of one or two companies. Some five or six of the steamers owned by Messrs. Wilson, Sons & Co., of Hull, are now in service or are about to be commissioned, the boilers of which are water-tube of the Babcock & Wilcox type Some of them have been at work constantly for several years, but most of them have recently been built at Dundee. In all cases the sanction of the Board of Trade to the use of the boilers has been doled out in three-month periods; but it is satisfactory to know that, at the expiry of one, the other three months' certificate has always been forthcoming. Even in vessels for purely passenger-carrying purposes the renewal of the restricted period of certificate is being found a less difficult matter than was at first anticipated by the owners of such vessels. The Clyde river steamer *Meg Merrilees* for example, which was the first passenger vessel plying for hire in home waters to be fitted with water-tube boilers—in this case of the Haythorn type—has had her original certificate renewed without question for a further period of three months; thus practically sanctioning her for the whole season during which she plies on the Clyde.

"Scottish Lighthouses and how to control them," is a brief but accurate designation for a discussion which took place at a meeting of the Glasgow Chamber of Commerce, held in the last week of July. Mr. W. F. G. Anderson, of the Anchor Line, drew attention to the unsatisfactory constitution of the Northern Lighthouses Commission. When the Board was constituted about 100 years ago it was perhaps natural that they should have gone to the Parliamentary House in Edinburgh for a large number of its members. No doubt these lawyers were able and eminent men in their own way, but practical men were agreed that it hardly lay with them to manage the lighthouses of this country. Certainly the shipowners ought to have something to say in the matter. At present they contributed all the money for the lighthouses, yet they had no say in regard to their construction or position, or as to the expenditure of the money on them, although they were in the best position to know the real wants regarding lights. He thought the time had come when this matter ought to be altered. They found, for instance, that Scottish lighthouses were the most costly in the world. That might be owing to natural difficulties, but, if so, it was all the more necessary that shipping and not legal people should have charge of the lighthouses. The president said the directors would consider what action should be taken on this matter.

THE TYNE.

(*From our own Correspondent.*)

Shipbuilding.—A couple of months ago we called attention to the extraordinary brisk state of business prevailing at all the yards, and we can now repeat, without the least fear of violating the truth, that the general briskness is rather enhanced than otherwise. Speculations are rife as to how long this auspicious state of things may last, those of sanguine temperament giving the spell of prosperity the long tenure of three or four years to come, while others of a more practical turn look forward to the "boom" having exhausted itself by the middle of next year. We differ somewhat from these forecasts, but think that towards the end of 1899 signs of decadence may begin to manifest themselves, as all the big contracts now placed will by that time have been worked off. Besides, the brisk period will by that time have lasted rather better than three years, which experience shows to be the ordinary length of busy terms in shipbuilding. There is, apart from these considerations, a circumstance which enforces the belief that the existing great activity cannot be maintained for more than two or three years, and that is the enormous rapidity with which work can be turned out. A 5,000-ton cargo ship which, a quarter of a century ago, provided six months' employment for the principal sections of workmen in a yard, can be put out of hand in half the time, and the Atlantic liners, which in the best yards can now be commenced and completed within a term of two years, would, at the time we refer to, have taken a whole decade to build. Productive resources have, indeed, developed amazingly since the initiation of the nine hours' day, and it is consequently practically impossible for such a condition of activity as now exists to be maintained for any period longer than that previously suggested.

The wages question is now settled with all the sections of workmen, including the members of the Boilermakers' Society, and with the latter body agreements with regard to the questions of lost time and overtime have also been arrived at. We have little faith in any good resulting from these agreements—especially the last one—believing as we do that the working of overtime should be absolutely unrestricted. Overtime is an expensive luxury, and there is not a firm in the kingdom that would bring themselves to the payment of such prohibitive rates as are demanded, excepting under pressure. When an employer is willing to pay 50 per cent. above the ordinary rate of wages for the privilege of running his yard or factory some extra hours weekly, there must be some cogent reason influencing his action. We have always maintained that the excess rates to be paid in all cases constitutes a sufficient check upon the desire, whenever manifested by employers, to keep men working an unreasonably long time, and so long as that check exists there is no need for any agreement to limit the hours to be worked.

An incident of more than ordinary importance to the trade of the Tyne has just occurred, in the placing, by the Cunard Co., of an order for a high-class passenger and cargo boat of great size and speed. The successful firm is Messrs. C. S. Swan & Hunter, who built the *Ultonia* for the same company, and have long since proved its ability to give satisfaction in the execution of any kind of naval work. The new Cunarder is we understand, to be 600 ft. long, and to have a displacement measurement of 20,000 tons. The ship will, we believe, be built under cover, which cannot fail to be an advantage from the point of view of structural soundness, as the element of dampness during the progress of construction will be entirely absent. Messrs. Swan & Hunter are to be congratulated on having brought this important order to the Tyne, and we have no doubt that it will prove the precursor of many other orders for vessels of a similar class.

Another interesting fact that has come to light lately is the placing of an order with the Palmer Co. for a torpedo-boat destroyer, by a private firm. It is said that a well-known North-country shipowner is largely interested in this experiment, which is undoubtedly a novel one.

Messrs. Armstrong, Whitworth & Co. have also been favoured with an order from the Cunard Co., but in this case, the contract is merely for a cargo boat. It will, however, be of large size, and will involve the employment of a great quantity of wood as well as steel in the construction. The firm have an ice breaking steamer on the stocks, which puts into the shade all previously built vessels designed for a similar purpose. It is between 400 and 500 ft, long, and will have when launched a displacement of over 10,000 tons. The vessel is indeed as heavy and as strongly built as an ordinary battleship, and her engine power will be enormous.

Messrs. Doxford's system of "joggle" plating, has been adopted at this establishment, as well as at another large yard on the opposite side of the river. Some disputes have arisen in consequence of the employers demanding a reduction of the rivetting rates, equal to what is allowed on the Wear, where this system is in operation.

The absence of packing greatly minimises the difficulty of rivetting the frames to the shell plates, and hence the request for a reduction of the prices paid for the work. We believe the matter has, for the moment, been settled; but it will, in all probability, crop up again.

The tendency to beat the record, by producing vessels of greater size than had before existed, is daily becoming more pronounced, and at the moment there are in course of building, or about to be laid down, on the Tyne, at least six vessels that will average in length 520 ft. each. The tendency to increase the size of plates and bars used in construction, is also very marked; so much so, indeed, that in many instances, frequent substitutions of larger for smaller machines have become imperatively necessary. Many changes have taken place in the equipment of shipyards during the past quarter of a century, but it is evident that more radical changes are impending—changes in which the electric motor will play an important part.

It is understood that Messrs. Readhead have booked some orders for delivery eighteen or twenty months hence, and just now they have on the stocks the usual number of ships in the various stages of framing, plating, and preparations for launching.

The Tyne Shipbuilding Co.'s yard presents the customary appearance of activity, all the berths being filled, and the fitting out of a vessel in the water being well advanced.

The new yard at Howdon has been started, but as yet only a limited number of hands have been taken on, and progress is consequently slow. It is understood that a second keel is to be put down; but it is certain that the yard's contributions to the output returns this year will be small, if any. At Messrs. Dobson's, and also at Messrs. Wood & Skinner's yard, business continues brisk, and in each case a vessel is being got ready for launching. The small yards at Shields are all busy, and several new orders have been recently booked.

The large pontoon, belonging to Smith's Dry Dock Co., North Shields, has during the past few days borne the somewhat unusual weight of the Japanese passenger steamer *Nippon Maru*. The vessel, which has just been completed by her builders, Sir James Laing & Sons, had to be dry-docked for inspection and external cleaning, before running her trial, and there being no dock on the Wear large enough to receive her, she had to be brought to the Tyne for the purpose. It is, we should think, something of an honour to the principals of the Dock Co. that they should have had such a splendid vessel on their pontoon. This is not the only vessel that has been brought from the Wear to the Tyne lately in search of dry dock accommodation, as the s.s. *Tuscarora*, another of Sir James Laing's productions, has been docked for examination and painting in the graving dock of the Wallsend Pontoons' Co. The Tyne has certainly a distinct advantage over the Wear in graving dock accommodation, as well as in some other matters; but those who are responsible for developing the resources of the latter river are fully alive to the requirements of the time, and the difference of advantage mentioned will not continue to exist indefinitely.

Engineering.—The placing of so many large and high speed vessels as have been referred to on the Tyne, cannot but have a further stimulating effect on the local engineering trade, as all the vessels, we believe, will be engined at local works. The Wallsend Slipway Co., we understand, will supply the machinery for the big Cunarder about to be built by Messrs. Swan & Hunter, in addition to the machinery for several exceptionally large boats building at the Low Walker yard of Messrs. Armstrong, Whitworth & Co.

At the Neptune Engine Works, and at Messrs. Palmer's, there are also some exceptionally powerful engines to build, and at the St. Peter's Engine Works there is a quantity of warship machinery, independently of the merchant ship engines in hand.

Messrs. Hartness & Sibson, engineers, &c., of the Felling (Heworth Shore) have commenced the building of marine engines, &c., for fishing vessels, steam launches, tugboats, and other small craft. The firm having enlarged their works, and supplemented their existing plant with a quantity of up-to-date machinery, are in a position to deal effectively with whatever work they undertake, and to give earlier delivery than some of their older rivals. They have already, we understand, secured a number of orders, and all their departments are busy.

Messrs. John Abbot & Co., Gateshead, have had a prosperous time lately, and have just declared a satisfactory dividend. The other engine works at Gateshead, including Messrs. Clarke, Chapman, & Co.'s electrical works, are briskly employed: and at Messrs. Harfield's works, Blaydon, orders for steering gear and other steamship accessories are abundant.

Messrs. S. T. Taylor & Sons, of the Tyneside Boiler Covering Works, Scotswood, have largely developed their business since their removal from Gateshead, and have added to their other branches the manufacture of marine glue, to be used instead of pitch for caulking decks, etc., sectional covering specially adapted for high pressures; cements for ships' bottoms, etc. Among their principal covering contracts this year were two Japanese steamers built by Sir James Laing; two Russian passenger steamers built by Messrs. Wigham Richardson, and Messrs. Dobson & Co., and the s.s. *Ultonia* (Cunarder) built by Messrs. Swan & Hunter. Last year they covered the boilers etc., of the two torpedo destroyers built by Messrs. Doxford, and they have now arranged to carry out the necessary work of a similar kind, on the somewhat larger destroyer which Messrs. Doxford have on the stocks.

The demand for Cedervall's Protective Box for propeller shafts, for which Mr. George Noble, of No. 7, Dean Street, Newcastle, is the agent, is increasing steadily, and a good number have been supplied during the month to both new and old ships.

Mr. H. M. Wilson, of Crown Buildings, Side, has been very successful lately in placing Aspinall's Patent Governor (for which he is agent), on steamers built or being repaired in the district, among the vessels fitted being the *Buluwayo*, the *Beucentaur*, the *Johannesburg* and the *Kaffir*, owned by Messrs. Bucknall Brothers. Mr. Wilson is also doing a good business in the sale of Langridge's Patent Regulator for steam heating, &c.

Blyth.—At this steadily developing port, the kindred branches of shipbuilding and ship repairing are satisfactorily brisk, and at the shipping staiths, the greatest activity prevails. The shipments since last year have increased about 12,000 tons weekly, a result that should be regarded as highly satisfactory.

THE WEAR.

(*From our own Correspondent.*)

Shipbuilding.—The most notable events this month in connection with Wear shipbuilding, were the departure of the s.s. *Nippon Maru* from the port, and the commencement of plating by joggled frames at the yard of Messrs. Short Brothers. A deputation from Lloyd's Committee visited the yard a short time since to examine a section of joggled frame and plating without packing, and after careful inspection they expressed their unqualified approval of the arrangement. With so high a testimony in its favour, this system can hardly fail of receiving a large measure of success

Messrs. Priestman & Co. are preparing to launch another steamer of the *Unique* type, that is to say a self-trimmer, designed and patented by the firm a couple of years ago. This, we believe, is the third of the type built, one being for English and two for foreign account. The firm have three other vessels on the stocks, and one in the water, fitting out.

Messrs. Pickersgill have adopted the method of joggled plating, introduced and patented by Messrs. Doxford, and they are the second firm on the Wear who have done so, in addition to Messrs. Doxford themselves. Messrs. Pickersgill have made a slight departure from the original method by using what is called the "clincher" arrangement, which renders the removal of plates, in the event of repairs or alterations having to be done, a matter of comparative ease.

Further extensive alterations are being carried out at Sir James Laing's yards, with the view of making the new east-end yard a completely independent or self-contained establishment. Hitherto, the machinery of the middle and west yards was utilised for preparing the material used in ships building in the east yard, but now a new machine shed is being erected in the latter place, and this will be fully equipped with the best modern machinery. Every adjunct of an up-to-date shipyard will, in short, be provided, and the whole arrangement of the place will be such as to secure the best results in the most economical manner. There are now two very large boats laid down in this yard—one of them over 500 ft. long—and great activity prevails throughout the various departments.

Messrs. Robert Thompson & Sons have three large vessels in the plating, framing, and keel laying stages respectively, and have a fourth vessel of rather small size on the stocks at the Bridge Dock. At Messrs. Austin's yard there are three berths occupied, and the firm have, as usual, a large quantity of repair work in hand. The firm have not yet commenced to build upon the new ground recently acquired by them, and which has been carefully cleared and levelled. It is understood, however, that the commencement of building operations will not be long delayed.

Messrs. Blumer & Co. have, we understand, adopted a system of hydraulic rivetting for a portion of their work, and have made some other changes in the working arrangements of their yard, which are expected to help in the direction of economical production. The Sunderland Shipbuilding Co. have laid the keel for another Australian liner (the second this year), ordered by Messrs. Lund & Co., and have two other steamers of large size on the stocks.

Engineering.—There is no sign of a falling off of briskness at any of the Wearside engineering works, but in more than one instance an accentuation is distinctly manifested. All the principal firms have vessels being fitted with their machinery alongside the jetties connected with the works, and in all cases night shifts continue to be maintained.

The Sunderland Forge and Engineering Co., Limited, have a large number of important contracts in hand, and the electrical department is particularly busy. The works of Messrs. John Lynn & Co. are also showing a high degree of activity, and the forges in the vicinity are all kept briskly going. Ironworks continue in full operation, and foundries are still busy.

A very smart piece of repair work has just been successfully completed on a large steamer in the Wear by Mr. A. A. Rickaby, of the Bloomfield Engine Works, Monkwearmouth. The work was to render safe and seaworthy a cracked h.p. crank pin. A hole $4\frac{3}{8}$ in. in diameter was bored through the crank flanges and pin—a length of 2 ft. overall—one end being countersunk and the other end recessed for head of bolt and nut respectively. The whole work, including the fitting and screwing up of a suitable bolt, made expressly for the job, was done in the unprecedentedly short period of 40 hours. A repair identical with the above has been done on a locally owned load engine in even less time, the hole through crank pin in the latter case being of slightly less diameter. Both jobs were completed without taking the shaft from its place, the time and labour thus saved being very considerable.

The Hartlepools.—Shipbuilding at this centre shows undiminished briskness, and local steel works are kept going all possible hours to meet the requirements of shipbuilders and engineers in different kinds of material.

The electrical installation at the Hartlepool Engine Works is now complete, and the machinery in all the shops is driven by power transmitted from a central station. A large weekly saving in fuel is one of the beneficial results achieved, and there is also a considerable saving of labour. The speed maintained, too, is more equable and uniform, and taking all things into account, there is not the least reason to doubt that the firm have, by the adoption of electrical power throughout, taken a long step in the direction of further economising production.

Stockton.—Full activity continues to be noticeable at all the yards, and besides the berths being well filled, there are in all cases vessels being fitted out in the river. Messrs. Blair & Co.'s works continue as busy as ever, and smaller works in the locality are also well employed. Steel and iron works are kept going to their very fullest capacity, and the average weekly output is far above the average.

Middlesbro'.—The state of business at the principal yards here is still eminently satisfactory, there being some important repair contracts in hand to supplement the new work. Engineering works are still at the highest point of activity known for years, and foundries are showing almost equal briskness. Numerous new orders are said to have been placed with steel manufacturers this week.

Darlington.—At the Darlington Forge Co.'s works the briskness previously reported is maintained.

THE MERSEY.

(*From our own Correspondent.*)

THE exceptionally satisfactory outlook as regards not only marine engineering and shipbuilding, but all branches of engineering, to which I have referred in previous Notes, is more than fully maintained. All the principal establishments throughout this district engaged on marine engineering work are pressed with orders, and in many cases have more new work coming forward than they can entertain to comply with requirements as to delivery, and the result is that not a few orders have had to pass into other hands. In the general branches of engineering, the position is very much the same. Stationary engine builders, both in the light and heavy sections, have all as much work as they can yet through for some time forward, and boiler makers have perhaps not been so pressed with work for many years past. One great difficulty they are just now experiencing is their inability to get supplies of material from steel makers to complete orders, deliveries of which have been pressed for. To meet this almost unprecedented condition of activity throughout all branches of trade, extensions of works or enlargements of existing plant are being pushed forward in various directions.

The employment returns issued by the trade union organisations also bear evidence of the exceeding briskness of trade. The Steam Engine Makers Society has only 1 per cent. of its total membership in receipt of donation, and even this figure would be reduced in the event of a settlement of the South Wales coal strike. So far as Lancashire is concerned, the society has practically no unemployed members on the books in the important centres of Manchester, Bolton, and Oldham. The United Machine Workers Association is scarcely in the same satisfactory position, and throughout the society there are over 4 per cent. on benefit, but in Manchester only 2·4 per cent. are reported on the unemployed list, whilst at Barrow, Blackburn, Ashton-under-Lyne, and Preston an absolutely "clear book" is reported. Returns as to the state of trade continue of a most favourable character. Where it is not described as "good," "fair" or "moderate" is the return, and in no case is actual slackness reported.

Mr. John H. Widdowson, of the Britannia Works, Ordsall Lane, Salford, Manchester, has a good deal of special work in hand for Government and other requirements. One department in which the firm are very busy is in the manufacture of special taps for Belleville boilers, for which they have a large order in hand from the Devonport Dockyard. It may be mentioned that the introduction of Belleville boilers has quite revolutionised the tap-making trade, owing to the extreme accuracy which is required, and the firm claim that by the use of improved machinery they are able to produce a tap which works with much less leverage and strain than those of the ordinary type. The taps are specially tempered to cut the threads in the steel running joints and back nuts, and in the malleable cast iron junction boxes of Belleville boilers.

The firm are also busy in the production of taps for ordinary requirements, and have orders in hand for about five to six thousand of these. Mr. Widdowson has also introduced an improvement in his well-known tube plate tapping machine, which has been adopted at the Government Dockyards. This machine has entirely superseded the old method of cutting and piercing the bar to suit the different lengths of boilers. It is made with taps 2¼ to 4 in. diameter, and will tap every inch instead of 3 in. as formerly, so that it will operate upon any range of boilers. The taps are always in pitch, ranging from 4 ft. 6 in. to 8 ft. over the tube plate. In their general run of specialities the firm are introducing an improved engineers' two die screw-stock, useful both for the "Whitworth," and for ordinary "Gas" threads. The dies are made on a new principle, which enable them to cut with extreme ease without distorting the thread. By the improvements that have been effected the stock will cut almost as good a thread as the "Whitworth," and for many purposes is fully equal to the above pattern, whilst it costs only half the price. To cope with the rapid growth of their trade the firm are making considerable works extensions. These include additional workshop accommodation, where a large number of new and improved machines are being put down, and a new store-room, in which templates and gauges are kept, the firm having a large stock of these, to enable them to execute repeat orders with facility and accuracy. The extensions in progress will about double the present works capacity.

The other week, during a visit to the Manchester Ship Canal Docks, I had an opportunity of inspecting the new grain elevator, which has just been erected. This elevator, which is built on the most modern lines, at a cost of about £84,000, covers an area of 5,644 square yards. The main building is seven storeys high throughout the whole extent, and the central portion is thirteen storeys. The grain is moved from place to place in bulk without bodily labour, by means of a system of travelling bands, on to which the grain is poured from an outlet. These bands convey it with mathematical accuracy to any of their 226 bins, each 70 ft. deep, which are provided, and can withdraw what may be required from any one, and take it to any other of these receptacles. Underneath each there is a graduated outlet, upon the neck of which a bag can be placed, and the grain descending into it, passes an indicator, which shows the weigher the exact quantity for each sack. These sacks can also be carried upon bands and diverted into barges at the rate of 250 per hour. Loose grain can be similarly conveyed to barges at the rate of 150 tons per hour. The speed at which these bands travel gives an impetus that shoots the grain into the mouth of the receiver communicating with the bin or the barge. The interval between the two is, however, less than one inch, and both the receiver and the system of rollers for carrying the band on after delivering the grain are movable pieces of machinery that can be fixed anywhere. These bins will hold from 37 to 300 tons, and the full storage capacity of the building is 40,000 tons. There is also covered and ample accommodation for loading 40 railway waggons and ten carts at the same time. The steamer *Motka*, from New York, has just been cleared of 124,724 bushels of wheat in three days. This has been done by means of a "marine leg," which is projected from the tower into the hold of the vessel and then works continuously, dredger fashion, throwing the grain on to the band at the top. The new elevator forms not only a store for all the grain imported, but also a compact centre for distribution. Tons of grain can be dealt with as simply and quickly as the man in the shop can handle a scoop. There is probably no grain elevator in the world more completely equipped, and the relief effected by drawing the grain from the other warehouses and sheds in the docks has already ensured a profit for the labour department, apart from the economy gained by a perfect and systematic method of dealing with the grain traffic on the Canal.

In the iron trade of this district the position is one of increasing strength. Makers in most cases are well sold, and during the past month there has been a substantial upward move in prices, with a tendency towards further hardening. In pig iron list rates for local brands are nominally unchanged at 47s. 6d. for forge to 49s. 6d. for foundry, less 2½ delivered Manchester; but makers are indifferent about further business at present, and are practically declining to quote in the open market. Lincolnshire makers have put up their official rates 1s. per ton, their minimum being now 44s. 6d. for forge to 47s. for foundry, net cash, delivered Manchester. Derbyshire foundry remains without quotable change, but is firm at 50s. to 51s. net delivered here. Middlesbrough and Scotch iron are fully 1s. per ton higher than last month. Delivered by rail Manchester, good foundry Middlesbrough is not quoted under 51s. 1d. to 51s. 4d. net, although some qualities have been offering at the Manchester Docks at about 49s. Scotch iron now averages 51s. 3d. for Glengarnock, and 51s. 6d. for Eglinton, net prompt cash, delivered Manchester Docks. American pig iron remains much as last reported.

In the finished iron trade bars meet with an active demand, and Lancashire makers have advanced their list rates 2s. 6d. per ton, the minimum being now £6. North Staffordshire qualities remain at £6 2s. 6d. to £6 5s. delivered Manchester district. Sheets have shown some slight improvement, and now average £7 to £7 2s. 6d., and hoops are in moderate demand at association list rates of £6 10s. for random, to £6 15s. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment. It may be added that Lancashire makers have decided to cease supplying small quantities of bars out of stock at the same price as larger quantities which are specially rolled and sent direct to the customer, and are now charging 10s. per ton extra for small lots of under 5 cwt. of one size. It is reported that Yorkshire and North Staffordshire firms are also adopting a similar course. Following this move by the makers, merchants have under contemplation an official advance on their prices for iron out of stock.

A brisk demand, with a general upward move in prices, is reported in all departments of the steel trade. Hematites are now quoted 62s. to 63s. less 2½; local billets average £4 7s. 6d. to £4 10s. net; steel bars range from £6 7s. 6d. up to £6 12s. 6d. and £6 15s.; and common steel plates £6 12s. 6d. to £6 15s. For boiler plates the minimum official price has been advanced to £7 2s. 6d., with quotations in some instances as high as £7 5s. delivered in this district, and many of the makers so well booked that they cannot take new orders for anything like early delivery.

In the metal market there has been an increased demand for tubes, chiefly for locomotive and marine requirements, whilst rolled metals and brass and copper wire are in steady request. Prices are unchanged, but firm at full list rates, which for delivery in this district remain as under:—Brazed brass tubes, 8¼d.; common rolled brass, 6¼d.; common brass wire, 6½d.; copper wire, 7½d. per lb.

In the coal trade here an exceptionally satisfactory position is reported, pits generally being kept on full time, with little or nothing going down into stock, whilst prices have shown a strong upward move. The better qualities of round coal are of necessity meeting with only a limited demand for house-fire purposes, but any surplus supplies are for the most part going away for shipment, and the output of all descriptions of round coal is moving away freely. Engine fuel is also in good demand, some collieries being short of supplies to meet requirements of customers. With the opening of the present month list rates at most of the Lancashire collieries are being advanced 5d. and 6d. per ton on engine fuel, and 10d. to 1s. on other descriptions of fuel, except the best qualities of house coal, which are in some cases only being put up 5d. and 6d. per ton. Best Wigan Arley coal can scarcely now be quoted under 10s. 6d. to 11s.; Pemberton four-feet and seconds Arley, 9s. to 9s. 6d.; common round coals, 7s. to 8s.; common slack, 3s. 9d. to 4s.; and best qualities, 4s. 9d. to 5s. 3d. at the pitmouth.

In the shipping trade a large volume of business has been put through during the last few weeks, and there is a brisk demand for steam coal, both for bunker purposes and for export, whilst a considerable business has sprung up in house-fire qualities for shipment to Ireland and other ports. This increased business has necessarily brought about a corresponding improvement in prices, and steam coals delivered Mersey ports are quoted 9d. 6d. to 10s. for ordinary, and 10s. 3d. to 10s. 6d. for better qualities, with 11s. to 11s. 6d. quoted for house-fire descriptions. At the Partington tips, Manchester Ship Canal, good qualities of steam coal have been quoted about 11s. per ton.

THAMES.

(*From our own Correspondent.*)

THE Thames, Limited, is still busy with the fittings of the *Albion*, which lies in the Victoria Dock. Messrs. Maudsley, Sons, & Field, of Westminster Bridge Road, have her engines. The work which the Thames, Limited, were reported as being busy with for last month they are still at, and in addition they have a contract for a number of small span bridges for the Burmah railway. Should this railway be extended into China, as the Government are being urged to do, there may be further work from that quarter. The steel dock gates for the docks, Llanelly, are being proceeded with and are almost completed.

Brown's dry dock has been kept fully busy during the month. Amongst the larger vessels which have been in for repairs are *The Guinea*. The *Golden Castle* was also laid up for a time, and also two sailing ships. The steamer *Saba*, of Messrs. Scrutton, was also laid up in this dock for a time and was repaired. The two ships, *Atlantic* and *Sargassa*, were put in for alterations to their decks.

The very desirable twin-screw boat for the Thames Conservancy is lying in the dry dock of Messrs. John Stewart & Son. She has been fitted with very lightly built triple-expansion engines of 200 H.P. each. The weight of the parts was cut down to the minimum in accordance with the conditions of the contract. The conditions as to weight being that the total weight of machinery should not exceed 60 tons, including boilers and water. The engines look well, although of extremely light build. The high pressure cylinder is 6 in. and the stroke 18 in. There is only one boiler, its diameter being 11 ft. 6 in., and constructed to take a pressure of 160 lbs. The engines are surface condensing, and the circulating pumps are made by J. & H. Gwynne. Mr. A. G. Mumford, of Colchester, has fitted in the feed-pumps. The boiler is of the return-tube cylindrical type. A suction hopper dredger has just been finished by the same firm for the Russian Government. She has twin screws and compound engines and two cylindrical return-tube boilers. The Steam Navigation Co. are having a return-tube cylindrical boiler made for their steamer *Iris*, which plies between London and the Continent. The dimensions of the boiler are 14 ft. by 10 ft. 10 in. It was to take a working pressure of 160 lbs. and its weight will be 40 tons. The steamer *Brunnette* has just passed Lloyd's survey, and also the more trying one the German Lloyd's. This firm has been making her engines triple-expansion and her boilers are of the return-tube type. The Turkish Government have almost completed for them in this yard a boiler of the haystack type, like those which were fitted into the *Lord of the Isles* on the Clyde some twenty years ago. The boiler is of a most difficult construction. It is cylindrical, and looks like a vertical boiler on the outside. At the bottom are the fires, two at one side and two at the other. Above the fires is a water casing, which is stayed inside and connected to the upper part of the boiler by water-tubes. The hot gases circulate round the sides of the water casing and then through amongst the tubes, and finally rise up a middle space into the uptake. There is a water casing between the fire and the outside of the boiler and the joint at the bottom between the two shells is made with a large ring of channel iron section. The caulking is thus made from the outside. Six of Paul's patent barges have been fitted with their chain gearing by this firm. At first the chains were given out to contract, but those made outside worked so unsatisfactorily on trial that it was found necessary to make everything inside the works. This has been done with great satisfaction to the working of the barges. The dry dock of this firm has been kept fairly busy. Amongst the heavier work done in it, the tug *Port Victoria* was laid up in her for repairs and also the boat *Carbonaria*.

The *Daily Mail* has been startling the world lately with Naval Architectural notes and Marine Engineering news. We rubbed our eyes the other day when we read that Messrs. Yarrow had booked an order for five destroyers, each of which was to be fitted with Parson's patent steam turbines and the speed was to be, well, as high as the *Turbinia*. Now it is quite true that Messrs. Yarrow have booked an order for five destroyers for the Japanese Government, but those destroyers are not to be fitted with Parson's steam turbines, but with Messrs. Yarrow's own triple-expansion engines and his own improved water-tube boilers. These orders were recorded in the last issue of the MARINE ENGINEER, and Messrs. Yarrow are proceeding with them as fast as they can find room for them in their yard. It is true that two destroyers are to be fitted with Parsons steam turbines, one for the British Government and the other for a foreign Government, but these destroyers are being built in Parson's & Co.'s own new yard.

Mr. A. G. Mumford, of Colchester, has just had a trial of another set of water-tube boilers at his works before delivering them to the Admiralty. The trial gave every satisfaction. He is also full of orders.

The great heat wave which is passing over England is affecting the passages of the Thames steamers. This heat is causing a heat fog, which often delays and dislocates the traffic. On Saturday, 20th, and Sunday, 21st August, a dense fog hung over the North Sea and English Channel, and *La Marguerite*, of the New Palace Steamers, Limited, was unable, after she had reached Margate, of completing her passage to Boulogne. She landed all her passengers at that place, and after doing so it is said that, in avoiding another steamer, she backed on to the sands. The *Kohinoor*, *Royal Sovereign*, *Conqueror*, and *Friend of All Nations*, went immediately to her assistance, but the tide was falling and it was soon seen that she would not float till early in the morning. Her passengers were then sent by the other boats back to London. At low water it was seen that she had sustained no injury. Most of the pleasure steamers visiting Margate were several times in danger of colliding or running ashore. *La Belgique*, which had 1,270 passengers on board, did not arrive at Ostend until half-past eight on Sunday morning, 21st August, being 14 hours late. The *Swallow*, of the Steam Navigation Co., was also long behind her time. On Saturday afternoon the screw steamer *Toledo*, of Sunderland, struck the rocks off Scilly. The captain and crew had only time to launch a large boat when she sank. A collision occurred on Sunday morning, 21st August, seven miles east of the Shipwash, near Aldeburgh, between the Norwegian barque *Vimbro*, and an unknown steamer with a red funnel. The barque was left in a sinking condition.

BELFAST.

(From our own Correspondent.)

WORK in the shipbuilding and engineering industries has again settled down into its normal state after the July holidays. The good weather and the brisk state of trade, however, seem to be responsible for a great deal of laxity in the time kept by some of the men employed. Indeed, serious complaints are being made by managers and foremen generally on this score, as many as 25 per cent. of the men having been absent on various occasions lately. This state of affairs, it will readily be understood, means a seriously diminished output, and is all the more regrettable from the fact that it prevents new work on hand being laid down. The same state of matters seem to be prevalent all over shipbuilding centres. It would seem that the great struggle between capital and labour, so recently passed, is quite forgotten, and the men, with plenty of work before them, are again becoming troublesome. As regards new work, there still seems to be a fair amount of inquiries, although the great rush of some months ago seems to be past. But so far as this town and district is concerned, both engineering and shipbuilding works are still continuing to make extensive additions to ships and machinery to enable them to cope with present and future orders.

The Belfast Harbour Commissioners are also coming up with the times, as they are at present laying down plant and wires to light up the extensive area of the Dufferin and York Docks. They will also supply lamps for working cargo on board ship at a nominal charge. This and the electric light specially placed at the entrance will enable vessels to be handled and despatched with less risk, a greater punctuality, and will be a decided boon to vessels berthing at this port.

On the 4th inst. Messrs. Harland & Wolff, Limited, launched the twin-screw steel steamer, *German*. This vessel has been built for the Union Steamship Co. for their South African trade. The *German* is similar in design to the other vessels of this line known as the "G's," already running, but somewhat larger. She will be propelled by twin-screws, driven by two sets of triple-expansion engines, and while providing a very large carrying capacity for cargo on a light draught of water, the *German* will have unusually complete accommodation for passengers. She will be specially fitted with every convenience, including electric light and refrigerating and cold chambers for the conveyance of fruit, &c.

On the 18th inst. the new steamer *Statendam*, also built by Messrs. Harland & Wolff, Limited, to the order of the Holland American Line, left the Alexandria wharf and proceeded down the lough for trial and adjustment of compasses. This steamer has a gross tonnage of about 10,400 tons, her dimensions being—Length, 515 ft.; breadth, 59 ft. 6 in.; depth, 43 ft. 6 in. She will be propelled by two sets of engines constructed by the builders in their usual style. She is also equipped with a full installation of electric light and refrigerating machinery, and all the latest appliances for rapid handling of cargo and general efficient working of the ship. Accommodation is provided for a large number of passengers, for whose comfort every convenience has been fitted, the vessel being tastefully decorated in cabins and saloons, which are large and airy, and in the builders' usual handsome style. This ship is intended for the trade between Rotterdam and New York, also with her sister ship, *Rotterdam*, also lately built by the same firm. After a very successful trial the steamer left to take her station on above-mentioned route.

We might also mention that the *Oceanic* is at the present time receiving a "brushing" attention at the hands of painters in the yard of Messrs. Harland & Wolff, Limited. The leviathan proportions of the vessel begin to show as she advances toward completion.

On the 8th inst. there was launched, from the south yard of Messrs. Workman, Clark & Co., Limited, a steel screw steamer, named the *Heathmore*, for the firm of Messrs. Wm. Johnston & Co., Limited, Liverpool. She has been designed to suit their general cargo and grain trade from the Danube, and is capable of carrying a large deadweight cargo on a light draught. The *Heathmore* is built under special survey and to the British standard of the Corporation of Shipping, Glasgow, and is 330 ft. long by 46 ft. broad, 26 ft. 9 in. deep, moulded. She has a complete iron deck of chequered steel plates, and suitable arrangements are made to enable the vessel to be adapted for cattle trade in a minimum of time. A cellular double bottom for water ballast purposes extends from fore and aft, and her holds are also divided to suit grain cargoes. Machinery capable of developing 1,200 H.P., built under special survey, will be fitted on board, and she will shortly take up her station between the Black Sea and Liverpool.

Altogether the engineering and shipbuilding industry is in a very prosperous condition here at present. Let us hope that the workmen will be conscientious in their demands, so that work may not be interrupted during the remainder of the year. We have also to say that the machine makers, land engine, and boilermakers are also well employed, and if the improved indications of business in the linen industry continue, the town and district will be kept in a healthy state of business for some time to come.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—There are further signs every month of the increasing importance of the shipbuilding trade to Barrow. Messrs. Vickers, Sons & Maxim are making arrangements on a large scale, which will enable them to undertake a much fuller programme of work than was possible under old conditions, and the Naval Construction Works, under its new auspices, are being arranged to deal with a fuller tonnage and with greater dispatch in delivery. Inquiries from all sources are coming to hand freely, and new clients of first rank are disposed to become customers. No new orders have been booked during the month beyond the second order for another first-class cruiser for the Admiralty of the *Cressy* type, but inquiries are very active and prospects of good orders are better than they have ever been. The new battleship building at the Naval Construction Works is being proceeded with very rapidly, and there seems reason to believe she will be completed and delivered in the shortest time on record. The Barrow yard possesses very great facilities for the building of warships of all sorts, inasmuch as not only are the launchways very convenient, with a good hard bottom capable of sustaining any weight, and possessing the proper declension, but there is any amount of modern machinery for the plate benders, cutters, drillers, &c., and a great deal of room to move about in. A ship 1,200 to 1,500 ft. long could easily be built in the Barrow yard and launched with the greatest ease. The *Vengeance* will probably be launched in November. In the meantime her engines, Belleville boilers, and other fittings are receiving attention. Her armour-plate is being made by the builders at their Sheffield works, and much of it has already been fixed on the vessel. The same firm are also engaged in making her guns. The new type of 12-inch breech-loader, which Vickers, Sons & Maxim, Limited, are engaged in making for the *Vengeance* and other ships of our Navy will, it is stated, be the most powerful weapon of its calibre and weight yet constructed. The new gun will be 41 ft. 6 in. long, and its tremendous hitting power is due to the burning of a 207 lb. charge of cordite in a chamber 17½ in. diameter, and 87 in. long. The 850 lb. projectile will leave the muzzle with a velocity of 2,750 ft. per second, and an energy of 44,573 foot-tons, or about 33 per cent. more energy than is imparted to its projectile by our present 12-inch naval gun, which, however, is only 37 ft. long, and only capable of a muzzle perforation of 36·8 in. of wrought iron, the Vicker's gun being equal to the perforating of 9·1 in. more. The French 12-in. weapon is 6 in. longer and fires a projectile weighing 643 lbs. with a muzzle velocity and energy of 2,625 foot seconds and 30,750 foot tons respectively, or equal to a muzzle perforation of 37·3 in. of wrought iron. It will be easy to work out from these figures that the British make of gun is still in advance of any other, and that Vickers, Sons & Maxim, with their great steel works at Sheffield, at which armour-plates, guns, forgings, &c., are produced with their other works at which ammunition of all sorts is made, and at the Naval Construction Works, at which the largest and smallest warships of the most modern types are built, are well to the fore in the work of keeping this country well up to date in warship construction and in the other incidentals that make warships effective engines of destruction. The proposal has been made in this district that the great Cavendish dock at Barrow, about 100 acres in extent, should be offered to the Admiralty, along with the Vulcan works alongside, as a place where repairs to Admiralty ships could be conveniently undertaken. The Vulcan Works were originally built by the late Mr. S. J. Claze, of Derby, for the building of rolling stock; subsequently they passed into the hands of the Vulcan Steel Co., which undertook forgings and all classes of steel work. Later on it was acquired by the Tubular Frame Waggon Co., Limited, which gave up business after a brief existence. Since then, the works have been dismantled, but they are considered eminently adapted for a repair engineering works, and being situated alongside the Cavendish Dock at Barrow, it is considered a very suitable acquisition for the Admiralty, for repair work especially. The dock is connected with the general dock system at Barrow, and as the entrance is 100 ft. wide the largest men-of-war afloat could get into it. The dock would, of course, require dredging to a depth of 30 ft., but if there was a prospect of the Admiralty coming to Barrow this work would soon be undertaken. There are those old shipbuilding yards at Barrow, which could easily be acquired by any firm with good launching ways on to Walney Channel in deep water. One of these is the Graving Dock Shipbuilding Yard, with graving dock capable of taking in ships of 500 ft. long, and useful for repair work. The other two yards were formerly employed in the work of building wooden ships of small tonnage, but they are admirably situated for iron or shipbuilding yards, inasmuch as the Barrow plate mills are alongside.

There is quite a disposition in Barrow to start one or two small shipyards, as it is felt the success of the big yard in the place has proved the advantages the town affords, and there is much work offering which the big yard cannot undertake and which would be the very life of a series of small yards. If the present graving dock at Barrow were increased in length and an approach made from the Devonshire Dock instead of as at present from Walney Channel, a very good repair trade would soon centre itself at Barrow. The new armoured cruiser, the order for which has been placed at Barrow by the Admiralty, is a sister ship to the *Hogue*, now being built there. She will be named the *Euryalus*, after a great Trojan warrior. The trial trips of the four torpedo-boat destroyers built at Barrow have compulsorily been deferred on account of the South Wales coal strike and the difficulty there has been to get the necessary high quality of steam coal to acquire the requisite speed. So soon as a supply is to hand, these torpedo-boat destroyers will, it is expected, run through their trials with ease, as it has already been ascertained they possess more than the requisite power to give the 30-knot speed. The Thornycroft boilers which have been adopted have given no trouble, but the vibration caused by the engines has raised a difficulty which has at length been very satisfactorily got over. It is believed that the difficulty as to vibration in this class of steamer will be got over by the adoption of the Yarrow, Schlick, and Tweedy system of engines. They have been adopted in the twin-screw steamer *City of Cornwall*, built at Barrow for the Fleetwood and Belfast service, and which on trial gave the greatest possible success. These engines consist of a high pressure, an intermediate, and two low pressure cylinders, and the cranks are balanced so accurately and the movements so carefully synchronised, that each movement neutralises another, and the result is a complete absence of vibration. By adopting engines of this sort very much higher speeds and greater power will be possible. Running at full speed, a glass of water brimful can be placed aft immediately above the propellers, and will not spill. That is, of course, if the sea is level and quiet. Very much work has been done during the month in the building of the two Clan Line steamers and the two British and African steamers now in progress of construction at Barrow. These four ships will soon be launched, as will also a large steam yacht for Sir William Wills, of Bristol. The room these ships occupy on the launching ways is required for other vessels, which are at present being offered to builders. The keel of the first-class cruiser *Hogue* has been laid, and the frames bent. She will soon be showing much progress. Throughout the Barrow yard a very big scheme of electricity is being put down as well for power as for illumination, and in almost every department extensions are being made with the view of increasing the capacity of the yard and of enabling the company to get through a fuller programme of work with greater ease and comfort. More men are employed on the yard than at any previous time, and many more could be employed if it were possible to get hold of them. This is particularly the fact in the engineering department, where the shops are working day and night. There is a scarcity of houses in Barrow on account of the increased number of workmen employed, and several big schemes to provide a large number of houses are being developed. It is a fact that if there were 500 more cottage houses in Barrow at present they would be forthwith occupied, and this number does not represent the ultimate extension of house property that will be necessitated in the place of the growth of the shipbuilding and kindred industries. Indeed, the outlook all round is very cheerful, and there are evidences of plenty of work for shipbuilders in the future.

Shipbuilding Materials.—There is a very brisk request for shipbuilding material of every description, and makers at Barrow are exceedingly busily employed. The demand for both heavy and light plates is exceedingly brisk, and not only are makers very fully sold forward, but they are able to keep their mills constantly and regularly employed. The Barrow Steel Co. is now producing over 1,000 tons of this class of steel per week, and in a short time the output will be increased to 1,200 tons per week. In the West Cumberland district our old works at Workington are being resuscitated, and it is proposed to put down steel plate mills in order to develop the mild steel trade.

The hematite pig iron trade of the north-west of England has undergone a marvellous change during the month. The demand has increased to a very considerable extent and makers find themselves unable to meet the requirements of consumers. They are very fully sold forward and with an aggregate of 41 furnaces in blast as compared with 38 last year, cannot cope with the demand. They cannot increase their productions on account of the small output of native iron ore. Prices have again gone up with a bound and are now quoted by makers at 54s. to 54s. 6d. per ton net, f.o.b., for parcels of mixed loads of Bessemer iron. Warrant iron is at 52s. 11½d. sellers, with buyers offering a halfpenny less. Stocks of ore have been further reduced and now stand at 141,731 tons, or a decline on the year of 42,719 tons, and there seems every prospect that stocks statistically will be even further reduced. The outlook for the hematite iron trade is in fact very satisfactory.

Shipping.—The returns show that this year up to date 331,592 tons of pig iron have been shipped compared with 284,458 tons last year, an increase of 47,134 tons. The exports of steel have been 352,506 tons compared with 297,178 tons last year, an increase of 55,3.8 tons.

Miscellaneous.

Mr. Gretchin on the Belleville Boiler.—We would draw attention to the very important statement made by Mr. Gretchin chief engineer of the Russian Volunteer Fleet. This is no statement made by one who has attended a casual trial of this or that boiler; it is a statement made by one who has the best opportunities for knowing, for he has had both the Scotch cylindrical boiler and the Belleville boiler under his charge. The charges that he makes against the Belleville boiler are—1. That they require constant attention on the part of stokers, and that it requires a greater number for them for Belleville than for cylindrical boilers of the same power. 2. That it requires a greater number of machinists to keep Belleville boilers in order in consequence of the necessity of keeping a greater number of joints right, and of auxiliary machinery such as feed pumps, air blowers, automatic feed regulators, blow off apparatus reducing valves. Moreover, he says that in the voyage of the *Kherson*, he found that the ordinary complement of stokers was insufficient and four stokers and two helpers were added. With Welsh coal the Belleville required 10 per cent. more coal than the cylindrical type, and with inferior Japanese and other smoky coals 30 per cent. more. This is a very serious indictment, coming as it does from a gentleman who is responsible for the working of both types of boilers, and we shall be glad to hear what Messrs. Maudslay, Sons, & Field have to place on the other side of the account.

Institute of Marine Engineers.—The eighth annual dinner in connection with the Institute will be held on Wednesday, October 12th, in the King's Hall, Holborn Restaurant, on which occasion the President, John Inglis, LL.D., will be received and welcomed on his first official visit since his election. It was considered that October would be a more seasonable month than June to have the dinner this year, hence the alteration of the date from their usual.

Messrs. Wilcox Bros. having had their offices burned down, they are now conducting their business from 15, Norfolk Street, Sunderland. The are pleased to be able to state that they have saved all their drawings, papers, etc, and therefore are in a position to carry on their propeller and evaporator business as usual.

The Manchester Steam Users' Association. — We have before us the memorandum by the chief engineer of the association, Mr. C. E. Stromeyer, M.I.C.E., which was presented at the annual meeting of the general body of the members. It commences with an extremely interesting account of the early life and work of the late Mr. Lavington E. Fletcher, who occupied so successfully the position of chief engineer to the association from 1861 till his death in 1897. On the matter of the average cost of a boiler explosion during the recent five years, a very interesting tabular statement is given from which it can be deduced that such average cost amounts to only fifteenpence per boiler, a remarkably small amount. The advice to boiler attendants, which was issued early in the year, is included in the memorandum. Some extremely valuable advice is given with reference to the removal of scale, viz.—that if the deposit is removed before it is allowed to get dry on the plates, it can be swept off the surfaces as mud. Great prominence is given to the necessity of reducing the amount of oil, particularly of mineral oil, admitted to the cylinders owing to the serious effect it has upon the plates owing to its heat non-conductive properties. It is stated that a thin film of hydrocarbon lubricant 1-100th in. in thickness will retard as much or even more heat than a layer of scale 1-10th in. thick or as a steel plate 10 in. thick. Taking the memorandum as a whole, it contains valuable information and much food for reflection for owners of boiler plant, particularly in view of the new Workmen's Compensation Act which came into force on July 1st last.

New Glasgow Industry.—Multifarious and diverse as are the industries carried on within and around the city of Glasgow, one additional new industry is about to be started. This is the manufacture, in indurated wood fibre or wood-pulp, of articles required for life-saving equipment on board ship, such as buoyancy tanks for lifeboats, buoyant deck seats, lifebuoys, etc. Plans have passed the Dean of Guild Court for new works, offices, &c., to be erected for this purpose in Mansfield Street, Govan. The firm about to start the works are Messrs. F. & A. Swanzy, of Cannon Street, London, whose manufacture of such articles, under Warren s Patents, has hitherto been carried on at Orchard Works, Yiewsley, Middlesex.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—ENGLISH.

Marjorie.—On July 5th there was launched at Sunderland a steel schooner-rigged steamer of about 722 tons gross, named the *Marjorie*, for Messrs. Lockett & Judkins.

Corona.—Lately there was launched at North Shields, a steel steam ketch, of about 149 tons gross, named the *Corona*, for the Grimsby and North Sea Steam Trawling Co., of Grimsby.

Scarthoe.—On July 20th Messrs. Ropner & Son launched at Stockton-on-Tees, a steel screw steamer of the following dimensions:—Length between perpendiculars, 336 ft. 6 in.; breadth, extreme, 46 ft. 6 in.; and depth, moulded, 27 ft. 8 in. The steamer has been built to the order of Messrs. Bennetts & Co., Grimsby, and is of the three-decked rule, fitted with the builders' patent trunk, full poop, bridge, and topgallant forecastle. She has double bottom on the cellular principle for water ballast, and will carry about 6,000 tons on Lloyd's summer freeboard on a light draught of water. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited, having cylinders 24½ in., 40½ in., and 66½ in. by 42-in. stroke. The vessel was named *Scarthoe* by Mrs. Squires, of Grimsby.

May.—On July 21st there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel lighter of the following dimensions, viz.:—Length, over all, 71 ft.; beam, moulded, 19 ft. 8 in.; depth, 8 ft. 6 in. in midship; and with a carrying capacity of 250 tons. She was built to the order of Mr. John Scott, High Street, Hull. As she left the ways was named *May* by Mrs. Day, of Hull.

Pola.—On July 21st there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a steel screw steamer, built to the order of the English and American Shipping Co., Limited, of which the managers are Messrs. C. T. Bowring & Co., London. Her dimensions are as follows;—Length, 328 ft.; breadth, 47ft.; and depth, moulded, 25 ft. Her engines, also built by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 24 in., 40 in. and 64 in. diameter, by 45 in. stroke, steam being supplied from two large steel boilers working at a pressure of 160 lbs. per sq. in. The vessel, which was named the *Pola*, is intended for the general cargo trade.

Hercules.—On July 26th there was launched at North Shields, a steel steam ketch of about 160 tons gross, named the *Hercules*, for the Grimsby and North Sea Steam Trawling Co., Limited, of Grimsby.

Cassiopea.—On July 26th there was launched at North Shields, a steel steam ketch of about 149 tons gross, named the *Cassiopea*, for the Grimsby and North Sea Steam Trawling Co., Limited, of Grimsby.

Beatrice.—On August 3rd Messrs. Bartram & Sons launched at their south dock shipbuilding yard, for Messrs. Charles Howard & Sons, London, a large steel steamer of the spar-deck type, with poop, extra long bridge and topgallant forecastle. The principal dimensions are as follows:—Length, 350 ft.; breadth, 45 ft.; depth, 26 ft. 9 in., and gross tonnage about 3,500 tons. She has been built to take the highest class in Lloyd's registry, and under the personal supervision of Mr. James Pollock, of London, and Captain Edwards, of Sunderland, on behalf of the owners. The hull is divided by six steel water-tight bulkheads, and there is also a cellular double-bottom divided into tanks for trimming purposes and of sufficient capacity to contain 880 tons of water ballast, this will enable the ship to make passage in ballast with comfort and safety. The vessel is built under the deep frame system, which dispenses with hold beams and other obstructions, and thus she is able to take in machinery and other large general cargoes. The poop is also fitted up for cargo purposes, the officers', captain's, and saloon accommodation being fitted on the bridge. The deck machinery consists of five large steam winches and steam steering gear by Messrs. J. Lynn & Co., Limited, Pallion, and direct acting steam windlass by Messrs. Clarke, Chapman & Co., Limited, Gateshead, all worked from a large multitubular donkey boiler by Riley Brothers, of Stockton. The propelling machinery will be supplied by Messrs. John Dickinson & Sons, Limited, Monkwearmouth, and fitted with every improvement experience has suggested for safe and economical working, including Caird & Rayner's evaporator and Morison's feed heater. The cylinders are 24 in., 39½ in., 65 in., and the stroke 42 in., the boilers are of large size, single-ended, and fitted with Howden's system of forced draught, and will work at 180 lbs. pressure. As the vessel left the stocks she was gracefully named the *Beatrice* by Miss Alice Rhind, of Sunderland, and was then towed to the south dock to have her masts fitted on board. A complete installation of electric light will be fitted by Messrs. Clarke, Chapman & Co., Limited, Gateshead.

Mayflower.—On August 3rd the s.s. *Mayflower*, one of the largest vessels that Messrs. Craig, Taylor & Co. have as yet built, was launched from their Thornaby shipbuilding yard. The vessel is of the spar deck type, with poop, bridge, and topgallant forecastle, built of steel, to class highest in Lloyd's. The dimensions are—372 ft., 48 ft., 30 ft. 11 in. depth, moulded; she will carry over 700 tons deadweight, and be equipped with seven large double-powered steam winches, patent direct steam windlass, powerful steam steering gear, a full set of shifting boards for grain certificate, and all the latest improvements. She has water ballast in double bottom fore-and-aft, also in peaks, she is rigged as a fore-and-aft schooner, with telescopic masts, to Manchester Ship Canal requirements. Her engines have been constructed by Messrs. William Allan & Co., Limited, of the Scotia Engine Works, Sunderland, the cylinders being 28½ in., 38½ in., 68 in., by 48 in. stroke, with three boilers 13 ft. 6 in. by 10 ft. 6 in., working at 200 lbs. pressure. The steamer has been built to the order of Messrs. Robert Stewart & Co., Liverpool, and under the superintendence of Mr. C. Macdonald, of Messrs. E. F. Wailes & Co., Newcastle, the owners consulting engineers.

Queenmoor.—On August 3rd there was launched by Messrs. John Blumer & Co., at North Dock, Sunderland, the screw steamer *Queenmoor*, built for the firm of Messrs. Walter Runciman & Co., Newcastle. The dimensions of the vessel are as follow:—Length between perpendiculars, 290 ft.; breadth, 42 ft.; moulded depth, 21 ft. 6 in. The vessel is to have the highest class at Lloyd's, and is designed to carry 3,550 tons deadweight. The triple-expansion engines and the boilers will be built and fitted by Messrs. John Dickinson & Son, of Sunderland, the cylinders being 22 in., 36 in. and 59 in., with 39-in. stroke, the boilers having a working pressure of 160 lbs.

Kilmaho.—On August 3rd Messrs. J. Priestman & Co. launched from their shipbuilding yard at Sunderland, a fine steel screw steamer to the order of Messrs. John Cory & Sons, Cardiff. Her dimensions are:—Length, 297 ft.; breadth, 43 ft.; depth, moulded, 21 ft. The vessel is of the single-deck type, with poop, bridge, and forecastle, constructed to Lloyd's highest class on the deep frame principle, divided into watertight compartments by five steel bulkheads, with cellular double bottom in each hold. There are four very large hatchways on the upper deck, with all latest appliances for rapid loading and discharging of cargo. The engines are being supplied by Messrs. Hutson & Sons, of Glasgow, and have cylinders 21 in., 35 in., and 58 in., with a 39-in. stroke. Two large boilers are by the same firm, and will supply steam at a pressure of 160 lbs. The christening ceremony was performed by Miss Dickinson, of Jarrow, who named the vessel *Kilmaho*.

Saint Quentin.—On August 4th there was launched at Wallsend a steel steamer of about 3,170 tons gross, named the *St. Quentin*, for Messrs. Rankin, Gilmour & Co., of Liverpool.

Ihla Mexiamia —On August 4th Messrs. John Jones & Sons launched at Liverpool the steel steamer *Ihla Mexiamia*. She is intended for the River Amazon and for trading on the Northern Coast of Brazil.

Rhodesia and Valentia.—On August 4th Messrs. R. & W. Hawthorn, Leslie & Co., launched at Hebburn-on-Tyne, two steel screw vessels, to the order of the Irvin Steam Fishing Co., Limited, of North Shields. The vessels are of Lloyd's highest class, and to the owners' specification. The dimensions of the hulls are 93 ft. by 18 ft. 6 in. by 10 ft. 6 in. The vessels are fitted with machinery, having cylinders 14 in. and 30 in. by 21-in. stroke, with large boiler power, supplied by Messrs. Baird & Barnsley, of North Shields. The first vessel was named the *Rhodesia*, and the second *Valentia*.

Acara.—On August 4th there was launched from the Jarrow yard of Messrs. Palmer's Shipbuilding and Iron Co., Limited, a

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large screw steamer of the following dimensions, viz., 380 ft. by 47 ft. by 30 ft. 10½ in. moulded. The vessel is constructed of steel to obtain Lloyd's highest class, and will be rigged as a two-masted fore and-aft schooner. She is of the three-deck type, with a poop, bridge and topgallant forecastle. The poop is fitted for cargo; the bridge covers the machinery openings amidships and is left clear for cargo or bunkers. The accommodation for captain and officers is provided for in steel deck-houses on top of bridge-deck, the forecastle being fitted with the seamen's and firemen's accommodation. Arrangements are made for carrying water ballast in a partial double-bottom at aft, deep tank amidships and in the peaks. The vessel is fitted with two steel decks extending all fore and aft and she is divided into seven watertight compartments by means of six steel bulkheads. She will also be fitted with a complete system of shifting boards, grain hatches, and all the latest requirements for carrying grain cargoes in bulk. A powerful steam windlass is fitted for working the cables, and steam steering gear amidships, all necessary steam winches, derricks, &c., for the rapid loading and discharging of cargoes will be supplied and the vessel will be fitted with all the most modern improvements for a vessel of her class. She is designed to load 6,750 tons deadweight on about 25 ft. 10 in. draught. The engines, which are also being constructed by the Palmer Co., are of the triple-expansion surface-condensing type, with cylinders 24½ in., 41½ in. and 70 in. by 45 in. stroke, steam being supplied by two boilers, 14 ft. 9 in. diameter by 11 ft. 9 in. long, with a working pressure of 200 lbs. The vessel, which was named *Acara*, has been built to the order of James M. Wood, Esq., of Liverpool, and is being superintended during construction by Mr. Maxwell Hill, consulting engineer, of Newcastle.

Mars.—On August 4th Messrs. Furness, Withy & Co., Limited, launched from their Middleton shipyard, Hartlepool, a fine steel screw steamer of the following dimensions:—352 ft. by 47 ft. by 29 ft. 10 in. She has been built to the order of John Lockie, Esq., Sandhill, Newcastle, and is a fine type of a modern cargo boat, being built throughout of Siemen's-Martin steel, with large measurement and deadweight carrying capacity of about 6,250 tons, and is classed 100 A1 at Lloyd's. The vessel is of the single deck type, with poop, bridge and forecastle. The holds are fitted with iron grain divisions, and all deck erections, skylights, bulwarks, &c., are constructed of steel and iron; cellular double bottom fitted fore and aft for water ballast, the after peak being also available as a tank. The greater portion of the plates are in 24-ft. lengths, making the structure of the ship very strong. Six powerful steam winches, donkey boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse pipes, and other modern appliances are fitted for the handy working of the ship. The saloon and cabin providing accommodation for the captain is handsomely finished in polished hardwood. The rig of the vessel will be two-masted fore-and-aft schooner, and will be fitted with triple-expansion engines by Messrs. W. Allan & Co., Limited, Sunderland. On leaving the ways, the ceremony of christening the ship *Mars*, was gracefully performed by Mrs. Curtis, wife of Captain Curtis.

Silurian.—On August 4th there was launched by Messrs. R. Craggs & Sons, from their Tees dockyard, Middlesbrough, a handsome screw steamer, built to the order of Owen Willlams, Esq., of Cardiff, of the following dimensions:—Length, 230 ft.; breadth, 32 ft.; depth, 16 ft. 1½ in. She will be fitted with triple-expansion engines of 600 I.H.P., by Messrs. MacColl & Pollock, Sunderland, steam being supplied by an extra large boiler. The cargo outfit will be of the best description, and include large multitubular donkey boiler, and four extra powerful steam winches. The vessel will be practically self-trimming for coal cargoes, the hatches being specially arranged for this purpose. On leaving the ways she was gracefully named the *Silurian* by Miss Jameson, of Stockton-on-Tees. Both hull and machinery have been constructed under the inspection of Mr. T. A. Reed, consulting engineer and naval architect, of Cardiff. The owners were represented at the launch by Mr. Watkin Williams.

Wakool.—On Thursday, August 4th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a steel screw-steamer, built to the order of W. Lund, Esq., of London, making the fifth vessel built by the firm for his Blue Anchor Line, and a sister steamer is now under construction. The dimensions of the vessel are as follows:—Length, between perpendiculars, 400 ft.; breadth, 48 ft.; depth, moulded, 31½ ft., classed 100 A1 Lloyd's. The boat has been specially designed for the owner's line, running between London and Australia, her carrying capacity is 6,000 tons. Accommodation is fitted for 50 first-class and 50 third-class passengers. The steamer is built with full poop and topgallant forecastle, with long citadel bridge, at the forward end of which is placed accommodation for captain and first-class passengers, together with lavatories, bath-rooms, and rooms for stewardess, &c. At the after end of this bridge accommodation is fitted for the officers, engineers, apprentices, purser, refrigerating and electric engineers, together with officers' and engineers' mess-rooms. On top of this bridge deck a large house is built containing berths for several first-class passengers, Doctor and Steward, also bar and pantries. At the fore end of this house and forward of the machinery space there is a large dining saloon for first-class passengers, which is panelled out in two shades of polished oak, handsome mirrors are fitted with carved oak caps and moulding relieved with gold, the whole of the fittings being of solid white metal; there are three dining tables with revolving chairs, also sofas, book-cases, sideboards, &c., complete, this saloon is specially lighted and ventilated with dome skylight and large sidelights all round. On the top of main saloon is a large music room fitted in light oak, with a number of mirrors, and is tastefully decorated; this room is also lighted by a large dome skylight. In close proximity to the saloon is a large smoking room panelled in Australian hardwood, and mirrors, luxuriously fitted with lounges, tables, &c., complete; covering all this accommodation is a complete shade deck extending to the sides of the vessel, forming a promenade for the first-class passengers, 120 ft. by 48 ft., the only erection upon which is the captain's house and steering house. The former is handsomely fitted up in oak and mahogany, with sleeping berth, slate top chart table, racks, &c. accommodation for 50 third-class passengers is placed in the topgallant forecastle and under the fore end of the bridge, whilst the crew are all berthed in the full poop aft. The galley is built round the main mast on the spar deck, so as to be conveniently placed for the stewards, cook and crew, and is of exceptionally large dimensions and well ventilated; the range, steam and baker's ovens, &c., are of extra large size. The steam steering gear is by Messrs. Davis & Co., and stands in the engine-room casing at the after end, and is connected to the wheel-house on the shade deck by rods and bevelled gear. The after steering gear is of extra size and power, by Mr. John Lynn, of Pallion. There are eight steam winches for working the cargo, which have been built to the owner's special requirements with extra large drums, &c., by Mr. Robert Welford, of Pallion. Powerful steel derricks, &c., are fitted, and all gear for handling light and heavy cargoes. Abreast the main mast there are two large sidehouses connected by overhead bridge to the galley, built with complete accommodation for quarter-masters, carpenters, boatswains, and the various petty officers, including mess-room for same, &c. The whole vessel is entirely lighted throughout by electricity by Messrs. Troup & Curtis, of London. The whole of the forehold and fore 'tween decks (which are of very large capacity) have been insulated by Messrs. Gregson & Co., of London, for the carrying of frozen meat; the necessary refrigerating machinery (which stands immediately above this hold) is manufactured by the Haslam Foundry and Engineering Co., of Derby. This vessel will be placed on the Admiralty list; the 'tween decks (which are exceptionally high) are pierced all fore and aft for the accommodation of troops or emigrants; special attention has been paid to the ventilation of passengers' accommodation throughout the vessel. The main engines are by Messrs. the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne, the cylinders being 28 in., 47 in., and 78 in. by 54 in. stroke, with bronze propeller; the boilers are four in number, single-ended, working at a pressure of 180 lbs., and are fitted with Howden's patent forced draught. During construction the hull has been built under the constant inspection of Captain Ilbery, and will sail under the command of Captain Thomas, R.N.R., whilst the engines have been supervised by Mr. Shanks, of London. The vessel, when considered as a passenger and cargo steamer combined, is one of the largest and finest that has been built on the Wear. The launching ceremony was successfully performed by Mrs. David Tweedie, of Adelaide, South Australia, who named the vessel *Wakool*.

Lady Joicey.—On August 4th there was launched by Messrs. Short Brothers at Pallion, Sunderland, a steel screw steamer, being the 22nd vessel constructed by them for Messrs. Taylor & Sanderson. The dimensions of the vessel are—334 ft. long, 45 ft. beam, by 26 ft. 9 in. depth, moulded. She is provided with all the latest improvements for the expeditious handling of cargoes, and will take the highest class in Lloyd's Register. Engines and boilers of the most up-to-date type will be fitted by Messrs. Wm. Allan & Co., Limited, the cylinders being 25 in., 40 in., and 67 in., by 45-in. stroke. On leaving the ways the vessel was named *Lady Joicey* by Miss Joicey, daughter of Sir James Joicey.

Heathdene.—On August 5th Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched at Hebburn-on-Tyne a large steel turret screw steamer, built on the patent of Messrs. Wm. Doxford & Sons, Limited, of Sunderland, and to Bureau Veritas highest class. Her dimensions are—340 ft. long, 45½ ft. broad, and 27½ ft. deep. Her machinery, which is being supplied by Messrs. T. Richardson & Sons, Limited, of West Hartlepool, consists of triple-expansion engines, having cylinders 24 in., 39 in. and 66 in. by 45-in. stroke, with two boilers at 160 lbs. working pressure. The vessel, which has been built for Messrs. J. T. Lunn & Co., of Newcastle, was named *Heathdene.*

Trojan.—On August 6th Messrs. Cook, Welton & Gemmell launched at Hull the steam trawler *Trojan*, built to the order of Mr. T. Robinson, Grimsby. The vessel's dimensions are—93 ft. by 20 ft. 6 in. by 10 ft. 7 in. The engines will be supplied by Messrs. Crabtree, of Yarmouth.

Ivanhoe.—On August 6th Messrs. Cochrane & Cooper, Limited, launched from their Grovehill Shipyard, Beverley, a new steam trawler of the following dimensions:—112 ft. by 21 ft. by 11 ft. 6 in. depth of hold. The vessel, which is an addition to the fleet of the East Coast Steam Trawling Co., Limited, Hull, will be supplied with triple-expansion engines by Messrs. Bailey & Leetham, Hull, and will be complete with the most modern appliances for deep sea trawling. The launching ceremony was performed by Miss Deacon, who named the vessel the *Ivanhoe*, after which the company adjourned to the offices of the builders, where luncheon was provided, the usual toasts being duly honoured.

Pearl.—On August 6th Messrs. Wood, Skinner & Co., Limited, successfully launched from their shipbuilding yard at Bill Quay, Newcastle-on-Tyne, a handsome new steel screw steamer, to the order of Messrs. John H. Wetherall & Co., of Knottingley, Yorkshire. The vessel is of the following dimensions, viz.:—Length, 193 ft.; breadth, 29 ft.; depth, 14 ft.; and has been constructed under special survey for Lloyd's 100 A1 classification. She will be rigged as a fore-and-aft schooner, and will be supplied with all the most modern appliances and improvements for faciltating the rapid loading and discharging of cargo. Water ballast is provided in the cellular double-bottom all fore and aft. The cabins are arranged in the bridge amidships, having entrance through the chart-room above. Accommodation is provided for the engineers under the raised quarter-deck aft, and for the crew in the topgallant forecastle. A complete electric light installation will be fitted throughont the whole of the vessel, including the cabin accommodation, engine-room and holds. The vessel will be fitted with triple-expansion engines of the improved type, constructed by the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne, and having cylinders 16 in., 26 in. and 43 in. diameter, respectively, with a stroke of 30 in., supplied with steam by a large steel boiler working at a pressure of 160 lbs. per square inch. As the vessel left the ways she was christened *Pearl* by Mrs. John H. Wetherall, of Knottingley.

Syria.—On August 16th Earle's Shipbuilding Co. launched at Hull the steamer *Syria* for the Bennett Steamship Co., of Goole. The vessel is of the raised quarter-deck type, having a short bridge amidships, and topgallant forecastle. She is 210 ft. long; 31 ft. beam; and 13 ft. 8 in. depth, being built to Lloyd's highest class, and is intended for the Goole and Boulogne trade. Watar ballast is provided in the main and after holds, and strong web frames are fitted so as to enable beams to be dispensed with, and thereby leaving the centre hold space clear for the reception of cargo. The hatchways are of large size, and the derrick and cargo gear exceptionally strong, while three powerful winches are also provided for the rapid handling of cargo. The bridge is fitted up for the accommodation of the captain and 12 passengers, the entrance being from a deck-house above, which contains also a chart-room and steering house. The officers' and engineers' quarters are situated aft under the quarter-deck and those of the crew in the forecastle. There is a powerful combined hand steam-steering amidships and suitable screw aft. The vessel will be schooner-rigged, having two pole masts and fore-and-aft canvas. Her machinery, also constructed by Earle's Co., will consist of a set of triple-expansion engines of great power and of the most recent design, steam for which will be supplied by two steel cylindrical boilers, made for a working pressure of 160 lbs. per square inch. The launching ceremony was performed by Miss Edith Bennett.

Valentia.—On Wednesday, August 17th, Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, launched the s.s. *Valentia*, built to the order of Messrs. the International Line Steamship Co., Limited, of Whitby, and is the fifth vessel built by this firm for these owners. She is built on the three deck rules, with only one deck laid. Her principal dimensions are: Length, between perpendiculars, 342 ft.; breadth, extreme, 49 ft. 6 in.; and depth, moulded, 25 ft. 1½ in. The engines are constructed by Messrs. John Dickinson & Sons, Limited, of Sunderland, the size of the cylinders being 24 in., 40 in., 65 in. by 42 in., supplied with steam by three boilers working at 160 lbs. pressure. The vessel was gracefully christened and launched by hydraulic power by Miss Marwood, daughter of the secretary of the company. There were also present at the launch Mr. Christopher Marwood, secretary of the company, Mrs. Marwood, and Messrs. Bentley, Proctor & Bell, directors of the company, and Captain Thomas, who will take command. After the launch, which was most successful, the company adjourned to the firm's luncheon room, where the usual toasts were duly honoured.

Mount Royal.—On Wednesday, August 17th, there was launched from the shipbuilding yard of Messrs. C. S. Swan & Hunter, Limited, Wallsend-on-Tyne, a cattle and cargo steamer, *Mount Royal*. Her dimensions are:—Length, over all, 483 ft.; length between perpendiculars, 470 ft.; beam, extreme, 56 ft.; depth, moulded to shelter deck, 42 ft. 10 in. Engines, built by the Central Marine Engine Works, of West Hartlepool, have cylinders 28 in., 46 in., and 75 in.; stroke, 54 in.; 2,800 I.H.P.; three large single-ended boilers, fitted with Howden's forced draught. The steamer will carry a dead-weight cargo of 11,000 tons on a draught of water of 27 ft., and a measurement cargo of 18,000 tons. She is built to the highest class at Lloyd's, three-deck rule, and has also a complete shelter deck for the carriage of a large number of cattle. The crew are berthed under shelter deck forward, and a large number of cattle-men below them on the main deck. Officers and engineers' accommodation is provided in large houses over the shelter deck, above which is a house containing captain's room and chart room, over which again are the flying bridge and wheel-house. The vessel has an unusually large supply of water ballast, which is carried in the double bottom all fore and aft in fore and after peaks and in two large deep tanks, in all about 3,500 tons. The *Mount Royal* is a sister steamer to the *Milwaukee* and *Monarch*, built by C. S. Swan & Hunter, Limited, for the same line, Messrs. Elder, Dempster & Co.'s line of steamers between London and Montreal. The launch of the *Mount Royal* was attended by the High Commissioner for the Dominion of Canada, Lord Strathcona and Mount Royal, and Lady Strathcona, who performed the launching ceremony; also by Mr. and Mrs. Howard, Mr. C. A. Duff Miller, Agent-General for New Brunswick; Mr. Alfred Jones, Liverpool; Mr. G. B. Hunter, chairman of C. S. Swan & Hunter, Limited; Mr. J. Price, Mr. W. Denton, Mr. Charles S. Swan, directors; Mrs. G. B. Hunter, Mrs. W. Denton, Capt. Evans, marine superintendent of Elder, Dempster & Co.; Capt. Williams, s.s. *Milwaukee*; Capt. Owen, s.s. *Montcalm*; Capt. Petersen, Turret Line; the Spanish Consul, Mr. Santamarina; the Argentine Consul, Mr. Pelegrin; the Danish Consul, Mr. J. V. Faber; the United States Consul, Mr. W. W. Metcalf; the Belgian Consul, Mr. George Reid; Mr. W. Boyd, Wallsend Slipway; and Colonel Swan, Walker.

Sigrid.—On Thursday, August 18th, the Blyth Shipbuilding Co., Limited, launched from their shipbuilding and repairing works at Blyth a light draught steel-screw steamer of the following dimensions, viz.:—Length, 297 ft.; breadth, 43 ft.; and depth, 21 ft. 3 in. The cabins are arranged amidships. The vessel is built to class 100 A1 at Lloyd's, and is of the single deck type, having deep framing but no hold beams, thus giving a large area in the holds for stowing cargoes of the bulkiest description. Triple-expansion engines of large power will be supplied by Messrs. Blair & Co., Limited, of Stockton-on-Tees. As the

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vessel left the ways the ceremony of naming the *Sigrid* was gracefully performed by Mrs. Dunne, wife of Rev. Dunne, of Burnopfield. The vessel is built to the order of Messrs. Helmsing & Grimm, of Riga and Libau, under the superintendence of Captain Kontermowitz

Winifred.—On August 18th Messrs. Irvines' Shipbuilding & Dry Docks Co., Limited, launched a handsomely-modelled steel screw steamer of 4,785 tons deadweight carrying capacity on Lloyd's summer freeboard. This vessel has been built to the order of Messrs. The Pyman Steamship Co., Limited, West Hartlepool, and is built to Lloyd's highest class under special survey, and is of the following dimensions—320 ft., 46 ft., and 23 ft. $0\frac{1}{2}$ in.—having poop, extra long bridge, admirably adapted for the cattle trade, and topgallant forecastle for the housing of the crew, cellular double-bottom for water ballast all fore and aft. It may be also mentioned that this vessel is the first of her class to be built with the combined arrangement of double-bottom floors flanged and joggled on top, thus dispensing with the usual filling slips in wake of the outside stakes of plating at inner-bottom, the experiment being a perfect success. Special regard has been paid for dealing with rapid loading and discharging of cargoes, for which extra large hatchways have been fitted with powerful winches of the company's own make, and double derricks to each hatch, together with all the latest improvements in the entire outfit of the vessel, including steam-steering gear and the latest improved steam windlass, &c. The boats will be placed on a platform deck overhead. The engines are of the triple-expansion type, and will be supplied by Messrs. T. Richardson & Son, Hartlepool. As the vessel left the ways the christening ceremony was gracefully performed by Miss Scott, of West Hartlepool, who named the ship *Winifred*. The hull and machinery have been built under the personal supervision of Mr. Cromar, the owners' superintendent.

Bosnia.—On August 18th there was launched from the Jarrow yard of the Palmer's Shipbuilding and Iron Co., Limited, the largest cargo and cattle steamer hitherto launched from their yard (although battleships of greater dimensions have been built at Jarrow), to the order of Sir Christopher Furness, for the Hamburg-American Co. Her length over all exceeds 500 ft., her displacement is about 16,500 tons, and she has a measurement cargo capacity of 19,250 tons. The vessel is constructed of steel, and has been built under special survey to class 100 A1 in Lloyd's Registry. She is fitted with a straight stem and elliptical stern, and will be rigged as a four-masted fore-and-aft schooner. Spacious accommodation for passengers, captain, officers, engineers, petty officers, &c., is provided in large steel deckhouses on the shade deck, alongside of, and forward and aft of the engine and boiler casings. The seamen and firemen are berthed on the upper deck forward, and the cattlemen on the upper deck aft. The upper and main decks are of steel, and extend all fore and aft. A wood deck is laid in the forehold. The shelter deck, sides and deck extends all fore and aft, and is specially strengthened for the Atlantic trade. This 'tween deck is left clear and fitted throughout with the most improved and modern arrangement for carrying about 900 head of cattle. Additional cattle space is also provided and fitted up in a shade deck, which extends about 130 ft. over the the midship part of the vessel, and encloses the engine and boiler openings. The sides are constructed of steel, and are enclosed, and the deck is of wood. The vessel is divided into eight watertight compartments by means of seven steel bulkheads, all of which extend to the upper deck. Each cargo compartment is fitted with a complete set of grain division boards, extra large cowl ventilators, and all other requirements for the safe carriage of grain or other cargoes, and a complete system of hatches, winches, and derricks is provided for the rapid loading and discharging of cargoes. A powerful steam windlass is fitted forward for working the cables, and a combined hand and steam screw steering gear of special design is fitted in a large steel wheelhouse on the after end of the shelter deck. The vessel is lighted throughout by electricity, and will be fitted and finished as a first-class cattle and cargo steamer, including all the most modern improvements for the Atlantic trade. Ample water ballast is provided in a cellular bottom, which extends all fore and aft, also in a deep tank extending to the main deck, fitted abaft the engine-room. The after peak is also fitted as a trimming tank. The vessel will be fitted with triple-expansion engines, having cylinders of 30 in., 50 in., and 83 in., by 60-inch stroke, and with four boilers, having 18 furnaces in all, constructed by the Palmer's Co. The above vessel is the first of four large steamers at present under construction by the same builders to the order of Sir Christopher Furness. The christening ceremony was performed by Miss Annette Furness, in the absence of Lady Furness, who named the vessel *Bosnia*.

Ella Sayer.—On Saturday, August 20th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer, built to the order of Messrs. Fisher, Kenwick & Co., of Newcastle-on-Tyne, and of the following dimensions, viz.:—Length, 320 ft.; breadth, 45 ft.; depth, 23 ft.; and to class 100 A1 at Lloyd's on the single-decked rule. This vessel has water ballast fitted right fore and aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including four double-cylindered steam winches, direct acting steam steering gear by Messrs. Donkin & Co., of Newcastle, steam windlass, large donkey boiler, and Hastie's screw gear aft. The engines, which are to be supplied by Messrs. North-Eastern Marine Engineering Co., Limited, are of the triple-expansion type, having cylinders 22 in., 36 in., and 61 in., by 39 in. stroke, and working at a pressure of 180 lbs. On leaving the ways the vessel was named the *Ella Sayer* by Miss Sayer, of London.

Londesborough.—On Saturday, August 20th, Messrs. Wm. Gray & Co., Limited, launched the steel screw steamer *Londesborough*, which they have built to the order of Messrs. G. R. Sanderson & Co., of Hull. She will take Lloyd's highest class, and is of the following dimensions, viz.:—Length, over all, 336 ft.; breadth, 47 ft.; depth, 24 ft. 10 in.; and the deck erections consist of a poop, bridge over the machinery space, and topgallant forecastle. A handsome saloon and state rooms, together with the captain's and officers' rooms, will be fitted in the poo The hull is built with web frames and cellular double-bottom water ballast, five steam winches, steam-steering gear amidships and hand screw gear aft, patent direct steam windlass, horizontal multitubular donkey boiler, grain divisions, stockless anchors, and a complete outfit will be fitted for a first-class cargo boat. The engines are of the three cylinder triple-expansion type, made at the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited; they will develop over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., and large steel boilers, having a pressure of 160 lbs. per square inch, will give an ample supply of steam. The ship and machinery have been built under the superintendence of Mr. Robert Carson on behalf of the owners, and the ceremony of christening the *Londesborough* was gracefully performed by Miss Bessie Sanderson. The launch was very successful, and amongst those present were: Mr. G. R. Sanderson, Miss Sanderson, Mr. and Mrs. W. C. Gray, Mr. George Jones, &c.

Rowena and **Arctic.**—On August 20th Messrs. Cochrane & Cooper launched from their Grovehill shipyard, Beverley, two steam trawlers. The (s.t.) *Rowena*, 11 ft. by 21 ft., by 11 ft. 6 in., for the United Steam Fishing Co., Limited, Grimsby, was named by Miss Minnie Chesman, and will be fitted with triple-expansion engines by Messrs. Bailey & Leetham, Hull. The (s.t.) *Arctic*, 112 ft. by 21 ft. by 11 ft. 6 in., for Messrs. W. C. Edwards & Co., Limited, Hull, was named by Miss Clara M. Wilson, and will be fitted with triple-expansion engines by Messrs. Amos & Smith, Hull. Both vessels will be supplied with all modern appliances for deep-sea trawling. After the ceremony the company adjourned to the offices of the builders to partake of luncheon, and the usual toasts were duly honoured.

Althea.—On August 24th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel lighter of the following dimensions:—Length, over-all, 71 ft.; beam, moulded, 19 ft. 8 in.; depth amidship, 8 ft. 6 in., and with a carrying capacity of 260 tons. She was built to the order of Mr. John Scott, High Street, Hull (and under the superintendence of Mr. Townhill, consulting engineer), and is the fifth built for the same owner. As the vessel left the ways, she was christened the *Althea* by Mrs. Townhill, of Hull.

Glosterhill.—Messrs. Osbourne, Graham & Co. lately launched at Hylton, near Sunderland, a steam screw steamer, which is intended for the Baltic and coasting trades for the Broomhill Shipping Co., of Newcastle, through the Broomhill Coal Co. The dimensions of the vessel are:—225 ft. length between perpendiculars, 36 ft. beam, extreme, $15\frac{1}{2}$ ft. depth, moulded. The main engines have cylinders 18½ in., 30 in., and 49 in., by 33-in. stroke, and will be supplied by Messrs. George Clark, of Sunderland. The vessel was named *Glosterhill.*

LAUNCHES.—SCOTCH.

Shansi.—On July 21st Messrs. Scott & Co., launched at Greenock a steel screw steamer for the China Navigation Co., Limited. The dimensions of the new vessel are:—Length, 275 ft.; breadth, 38 ft.; and depth, moulded, 22 ft. 6 in.; of 2,100 tons gross, with a carrying capacity of 2,700 tons. The vessel, which was named the *Shansi*, is the last of a fleet of six which Messrs. Scott have built for the China Navigation Co.

H.M.S. Brenda.—On July 28th Messrs. John Reid & Co., Limited, Whiteinch, launched *H.M.S. Brenda*, a steel cruiser, which they have built for the Fishery Board for Scotland. The vessel will be used round the coast of Scotland for the protection of the interests of the fishing fleet, for which purpose a high rate of speed and good sea-going qualities are necessary. The machinery will be supplied by Messrs. Hall-Brown, Buttery & Co., Govan, and the vessel will be fitted throughout with electric light, having a search light of 25,000 candle-power. The naming ceremony was performed by Miss Campbell, daughter of Captain Robert Campbell, who will command the vessel.

Antleon.—On July 28th Messrs. Wm. Simons & Co., Limited, launched, from their works at Renfrew, the twin-screw sand pump hopper dredge *Antleon*, which they have constructed for the New South Wales Government, under the direction of Messrs. Wildridge & Sinclair, consulting engineers, Sydney. This vessel is specially constructed to work in shallow rivers, her loaded draught being 5 ft. She is of the following dimensions:—Length, 165 ft.; breadth, 35 ft.; depth, 8½ ft. Two independent sets of triple-expansion engines are fitted for propelling the vessel at about 8 knots speed. The boilers are of the water-tube type, supplied by Messrs. Babcock & Wilcox, Ltd., Renfrew. Working pressure 200 lbs. reduced to 150 lbs. at the engines. Two powerful sand dredging pumps are provided, each driven by separate engines, and connected to suction pipes, one on either side of the vessel looking aft. The exhausts from all the engines are taken to a separate condenser of cylindrical form, placed in the engine-room. The vessel is fitted throughout with electric light. Comfortable cabins are fitted for the officers at after-end of vessel, and crew's quarters forward. The *Antleon* was launched complete with steam up, and will go down the river for her trials in a day or two. The New South Wales Government has been represented in this country by Mr. James Fairweather, who has superintended the construction of the vessel.

Lisette.—On August 2nd there was successfully launched from the shipyard of Messrs. S. McKnight & Co. Limited, Ayr, a steel screw steamer of 1,150 tons, constructed by the above-named firm for East coast owners. The vessel is 220 ft. long, by 30½ ft. beam, and has been constructed to the highest class at Lloyd's, for general trade between London, east coast, and continental ports. On leaving the ways she was gracefully christened *Lisette* by Mrs. Brown, wife of one of the directors of the company. The vessel is to be fitted with powerful triple-expansion engines by Messrs. Hutson & Son, Glasgow.

Comeric.—On August 2nd Messrs. Russell & Co., Port-Glasgow, launched a large steel screw spar-decked steamer, named *Comeric*, for Messrs. Andrew Weir & Co., Glasgow. The dimensions are:—Length, 345 ft.; breadth, 49 ft. 9 in.; depth, 28 ft. 5 in. This steamer has a deadweight carrying capacity of 6,400 tons on Lloyd's freeboard. Triple-expansion engines will be supplied by Messrs. Rankin & Blackmore, Greenock, with cylinders of 25 in., 41 in., 67 in. by 45-in. stroke.

Gnat.—On August 3rd the Dundee Shipbuilders' Co. launched the steamtug *Gnat*, which they have built to the order of Mr. Joseph Constant, London. Her dimensions are:—Length, 72·6 ft.; breadth, 18·6 ft.; and depth, 9·10 ft. The *Gnat* is similar to the tugboats recently constructed by the Shipbuilders' Co. for the same owner, and is to be engaged towing on the river Thames.

Colombian.—On August 4th Messrs. Caird & Co., launched at Greenock a steel screw steamer, for the West India and Pacific Steamship Co. Dimensions:—Length, 420 ft.; breadth, 49 ft.; depth, 33½ ft.; gross tonnage, 5,700. The builders will supply triple-expansion engines of 3,500 I.H.P. The new steamer was christened *Colombian* by Countess Rasponi Dalle Testa, of Ravenna.

Limari.—On August 4th this vessel was launched by Messrs. John Reid & Co., Limited, Whiteinch, for the Compania Sud Americana de Vapores, Valparaiso, who are represented in this country by Mr. Thomas Dewsbury, Leeds. The *Limari* is almost a duplicate of the *Palena*, completed about two years ago by the same builders, and embraces every improvement in design and equipment to adapt her for the mail, passenger, and general cargo service carried on by the company on the western coast of South America. The vessel, which measures about 365 ft. in length, is built of steel to Lloyd's highest class, and is fitted with cellular water ballast bottom throughout. The two upper decks are of teak, and these are entirely taken up with accommodation for passengers, the upper or shade deck being used for an extensive dining saloon, social hall, and captain's rooms, while the promenade deck below this is occupied with state-rooms for passengers and officers, mail-room, specie-room, and other requirements of a first-class passenger steamer. The decorations, paintings, and glass-staining, as well as all the fittings and equipment, are executed in the most tasteful, complete and luxurious manner, indicating throughout the best results of experience in meeting the various exigencies of the company's service. The main deck is fitted almost entirely with cattle stalls, while the lower deck and holds are adapted for carrying cargo. In addition to the usual outfit of oil-lamps, the vessel has been fitted throughout with a complete installation of electric-lights, having two engines and two dynamos to work separately or together. The machinery, which is being fitted by Messrs. Dunsmuir & Jackson, of Govan, consists of triple-expansion engines, having cylinders 28 in., 45 in., and 76 in. diameter by 54 in. stroke. Mr. Dewsbury has been assisted in the supervision of the construction of the *Limari* by Mr. J. A. Wyllie, and the vessel will be commanded by Captain Roberts, who has been long in the company's service. On leaving the ways the *Limari* received her name from Miss Kate Dewsbury, daughter of Mr. Dewsbury.

Achroite.—On August 5th there was launched by Messrs. John Shearer & Son, at Kelvinhaugh, a steel screw cargo steamer, built to the order of Mr. William Robertson, Glasgow. The vessel is built to Lloyd's highest class, fitted throughout with electric light, and is of the following dimensions:—230 ft. by 34 ft. by 16 ft. 9 in. moulded, 1,300 tons gross, with triple-expansion engines supplied by Messrs. Muir & Houston, Kinning Park. The vessel was named the *Achroite* by Miss Clark, Park Drive, Glasgow.

Nestor, Jason, and Viking.—On August 9th, Messrs. Mackie & Thomson launched at Govan three trawlers for Mr. Frank Barrett, Grimsby. Two, the *Nestor* and the *Jason*, are of 210 tons each, and of the following dimensions:—Length, 110 ft.; breadth, 21 ft.; and depth, 12 ft. They will have triple-expansion engines by Messrs. Ross & Duncan. The third, the *Viking*, is of 160 tons, 100 ft. in length, 20 ft. 6 in. in breadth, and 7 ft. in depth, and will have triple-expansion engines by Messrs. Muir & Houston. The vessels, which are the last of an order for nine which Messrs. Mackie & Thomson have executed for Mr. Barrett, were named by Mrs. and the Misses Wright, Sunnyside Manse, Wishaw.

Simplon.—On August 18th there was launched by Messrs. Cumming & Ellis, at Inverkeithing, another trawler for the new fleet building by them for Messrs. Muirhead's Trawlers, Limited, Granton. The dimensions of the vessel are 109 ft. by 21 ft. by 11 ft. 9 in., and she is fitted with compound engines, having cylinders 21 in. by 42 in. by 24 in. stroke. Steam is supplied from a large boiler working at 160 lbs. pressure. The vessel is fitted with all modern improvements used in connection with fishing with the new otter gear, a double set of which has been supplied by the builders. A double-barrelled steam winch is also fitted on board. The vessel is built of steel 20 per cent. in excess of Lloyd's requirements, and as she is intended for fleeting the builders have kept in view the excessive strain she is subject to while at work, and have strengthened the parts most liable to be affected. The shell plating for half the vessel's length amidship is double at the loadline, and heavy cope irons are fitted outside the doubling plates. On leaving the ways the vessel was named the *Simplon*.

Yacona.—Lately, Messrs. John Scott & Co. launched at Kinghorn, a handsomely-modelled steam yacht, 188 ft. 6 in. by 27 ft. 2 in. by 13.85 depth, moulded, and 635 tons Thames measurement, built to the order of Mr. Walter S. Bailey, Commodore of the Yorkshire Yacht Club. The vessel has a most graceful appearance, and is fore-and-aft rigged, having two pole masts, with bowsprit and lower yard on foremast. There is a promenade deck amidships extending the full width of the vessel, and for about 100 ft. in length. The yacht is lighted throughout by electricity by Messrs. Holmes, Newcastle. The propelling machinery is supplied by the builders. As she left the ways she was gracefully christened *Yacona* by Miss Crawford, daughter of the senior partner of the firm.

LAUNCHES.—Irish.

Heathmore.—On August 2nd there was launched from the shipbuilding yard of Messrs Workman, Clark & Co., Limited, Belfast, a steel screw steamer for the firm of Messrs. William Johnston & Co., Limited, of Liverpool. She has been designed to suit their general cargo and grain trade from the Danube, and is capable of carrying a large deadweight cargo on a light draught. The *Heathmore* is built under special survey and to the British standard of the British Corporation of Shipping, Glasgow, and is 330 ft. in length, by 46 ft. breadth, depth 26 ft. 9 in., moulded. She has a complete deck fore and aft of chequered iron plates, the poop, bridge, and forecastle decks being of the same material, and suitable arrangements made to enable the vessel to be adapted for cattle transport in a minimum of time. A cellular double bottom extends from peak to peak for water ballast purposes. The vessel is subdivided in each cargo hold by wood athwartship bulkheads, and also by fore-and-aft bulkheads conforming to the requirements for the carriage of bulk grain. Machinery capable of developing 1,200 I.H.P., surveyed and built under the regulations of the British Corporation, will be fitted on board within the next few weeks, when the *Heathmore* will leave Liverpool to take up her station in the Black Sea and Danube trade.

German.—On August 5th there was launched from Messrs. Harland & Wolff's yard, Belfast, the Union Steamship Co.'s new steel twin-screw steamer *German*, built for their service to and from South Africa. The *German* is similar in design to the other vessels, known as the "G's," already running in the Union Line, but somewhat larger. She will be propelled by twin screws, driven by two sets of triple-expansion engines, and while providing very large carrying capacity for cargo on light draught of water, the *German* will have unusually complete accommodation for first, second and third class passengers.

LAUNCH.—German.

Elsa.—On July 30th there was launched from the yard of the Flensburg Shipbuilding Co. a steel screw steamer of 800 tons gross register. Dimensions are :—Length overall, 208 ft.; length on line of m.d., 200 ft.; breadth, extreme, 29 ft.; depth, moulded, 14 ft. 1 in. The engines will also be built by the Flensburg Shipbuilding Co. The owners are Neue Dampfer Compagnie in Stettin, and the ceremony of naming the vessel *Elsa* was gracefully performed by Mrs. Elsa Abel.

TRIAL TRIPS.

Helios.—On July 14th the new steamer *Helios* left the Tyne for a trial trip. This vessel, which has been built by Messrs. Wood, Skinner & Co., Bill Quay, for the Neptune Steamship Co., of Bremen, is of the following dimensions :—Length, 185 ft.; breadth, 29 ft.; and draught, 13 ft. The engines have been built by the North-Eastern Marine Engineering Co., Limited, Wallsend, and throughout the trial the working of same gave every satisfaction to the owners' representative.

Polarstjernen.—On July 14th the large new screw steamer *Polarstjernen*, which has been built by Messrs. C. S. Swan & Hunter, Limited, Wallsend-on-Tyne, for Mr. Alfred Christensen, of Copenhagen, left the Tyne on her trial trip. The vessel is of the following dimensions :—Length, 330 ft.; breadth, 45 ft. 3 in.; and draught, 23 ft.; and has a deadweight capacity of about 5,500 tons. The machinery, which has been constructed by the North-Eastern Marine Engineering Co., Limited, Wallsend, consists of a set of engines, having cylinders 24 in., 40 in., and 64 in. by 42 in. stroke, with two large steel boilers of 170 lbs. pressure. Throughout the trial the machinery worked well, and gave every satisfaction to all concerned. The vessel attained a speed of 11 knots on the measured mile, which was considered very satisfactory.

Otto.—On July 15th the new steamer *Otto*, which the Caledon Shipbuilding and Engineering Co., Dundee, have built for Thomas Wilson, Sons & Co., Limited, Hull, made her official trial trip on the measured mile at Auchmithie, which was run over four times, the mean of the runs resulting in a speed of 14 knots, this being considered very satisfactory. The *Otto* is a sister ship to the *Truro*, recently launched by the Caledon Co., and is 225 ft. long; 32 ft. broad; and 14·5 ft. moulded depth. She has a net register of 249 tons, and a deadweight carrying capacity of 880 tons. The steamer has been specially built with a view to further developing the trade between Hull and Antwerp and Hull and Ghent. She has been fitted with two of Messrs. Babcock & Wilcox water-tube marine boilers, and a set of triple-expansion engines having cylinders of 17 in., 30 in. and 52 in., with 36 in. stroke. The boilers are to have a working pressure of 225 lbs. per square inch. The hull and machinery of the vessel have been constructed to the requirements of the British Corporation Registry and the Board of trade.

Lars Kruse.—On July 16th the steamer *Lars Kruse*, built by Messrs. Carmichael, Maclean & Co., Greenock, to the order of Messrs. Svendsen & Christensen for the Steamship Co., Cimbria, Limited, of Copenhagen, went down the Clyde on her trial trip. Representatives of the owners, builders, and engineers joined the vessel at the Tail of the Bank on its arrival from Glasgow, where her machinery had been put on board by Messrs. Muir & Houston, and after compasses had been adjusted the *Lars Kruse* ran the measured mile. During the trials the engines worked smoothly, and a speed of ten knots was obtained, which was considered satisfactory. The *Lars Kruse* is a single-deck screw steamer, designed to carry a deadweight of 2,450 tons on light draught, and is furnished with all modern appliances for the rapid handling of cargo. She has been built with a view to adaptability for general trade, and special arrangements have been made for the convenient carrying of deck cargo when on the Baltic route.

Lady Jackson.—On August 18th the steam tug *Lady Jackson*, built by Messrs. Carmichael, Maclean & Co., Greenock, and engined by Messrs. J. B. Kincaid & Co., went on her trial trip This vessel has been built for London owners for service in the English Channel. The dimensions are :—94 ft. by 27 ft. by 11 ft. 11 in. moulded, During the trial everything went off satisfactorily, and a speed of over 11½ knots was attained.

Euston.—On July 18th, the new steamer *Euston*, built by Messrs. Ropner & Son, of Stockton-on-Tees, for Messrs. Evan Thomas Ratcliffe & Co., of Cardiff, made her trial trip. This steamer is built off the three-decked rule, with full poop, bridge and topgallant forecastle, and will carry about 4,400 tons deadweight on Lloyd's summer freeboard, on a light draught of water, and has all the most recent appliances for expeditious loading and unloading her cargoes. She is fitted with triple-expansion engines by Messrs. Blair & Co., Limited, of Stockton-on-Tees. The trial trip proved very successful, the machinery working very satisfactorily and giving out the best results, a speed of 11 knots being attained.

Clematis.—On July 20th the screw steamer *Clematis* was taken to sea for her trial trip. She has been built by Messrs. The Tyne Iron Shipbuilding Co., Limited, Willington Quay, for Messrs. Jos. Robinson & Sons, North Shields, and is for their Stag Line of steamers. The vessel's dimensions are :—Length, 344 ft. 6 in.; breadth, 46 ft.; and draught, 21 ft. 7 in. The engines have been supplied by the North-Eastern Marine Engineering Co., Limited, Wallsend, and are of their triple-expansion type, having cylinders 23 in., 38½ in., and 64 in. by 42 in. stroke, with two large steel boilers working at 180 lbs. pressure. Throughout the trial the engines ran perfectly, and gave every satisfaction to all concerned.

Trekieve.—On July 23rd the new screw steamer *Trekieve*, built and engined by Messrs. John Readhead & Sons, South

Shields, for Messrs. Edward Hain & Son, St. Ives, was taken on her trial trip off the Tyne, and had a series of successful runs, averaging a speed of 11½ knots. The vessel, which is 323 ft. long; 47 ft. broad; and 25 ft. depth, moulded, is of the improved single-deck type, with full poop, long bridge amidships, and top-gallant forecastle, and is classed 100 A1 at Lloyd's under special survey. The engines are of the triple-expansion type, having cylinders 24 in., 40 in. and 64 in. diameter by 42-in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch.

Regina and Rex.—On July 28th the steamers *Regina* and *Rex*, built by Messrs. Carmichael, Maclean & Co., Greenock, for Messrs. R. Simpson & Co., Hull, went down the Firth on their trial trip. The dimensions of the vessels are:—130 ft. by 23 ft. by 11 ft. moulded, classed 100 A at Lloyd's. These vessels have been specially built for carrying fish from the North Sea to the London market. The engines have been supplied by Messrs. Bow, M'Lachlan & Co., Paisley, and during the trial the engines worked smoothly. A speed of 11½ knots was attained, which was considered satisfactory.

Wilster.—On Saturday, July 30th, the fine steel screw steamer *Wilster* was taken to sea for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, for Messrs. Trechmann Bros., of West Hartlepool. She takes Lloyd's highest class, and her dimensions are:—Length, over-all, 300 ft.; breadth, 42 ft.; and depth, 21 ft. 9 in. The engines have been supplied by the Central Marine Engine Works of the builders, and are of their well-known triple-expansion type, having cylinders 21½ in., 35 in., and 58 in. in diameter, with a piston stroke of 39 in. The engines are supplied with steam by two large steel boilers working at a pressure of 180 lbs. per square inch. The day being fine, a large number of visitors went out with the vessel, amongst whom were—Mr. and Mrs. Otto Trechmann, Mr. and Mrs. Albert Trechmann, Mr. and Mrs. Charles Trechmann, Mr. John Trechmann, Mr. and Mrs. Herbert Geipel, Miss L. Murrell, Miss Weston, Captains W. and T. Watson, Captain B. Murrell (who has superintended the construction of the ship) was present, the shipyard was represented by Captain J. E. Murrell, and the engine works by Mr. James Lindsay. After adjustment of compasses by Mr. Berry a full speed trial was made with the log overboard, lasting about three hours, when an average speed of 11½ knots was recorded. Both ship and machinery gave entire satisfaction, and on the conclusion of the trial the vessel at once proceeded in ballast to St. John's, Newfoundland.

Sergei Witte.—On August 4th the screw steamer *Sergei Witte* went for a very successful trial trip off the coast. The vessel has been constructed by Messrs. Wigham Richardson & Co., at their Neptune Works, Newcastle-on-Tyne, to the order of the Archangel-Moorman Steam Navigation Co., of St. Petersburg, and is intended for their trade in the White Sea, Kara Sea and Arctic Ocean. She is about 200 ft. long, and is fitted with engines of Messrs. Wigham Richardson & Co.'s own make, which on the trial trip worked without the slightest hitch, propelling the vessel at a speed of 11 knots. The steamer has a clipper stem with a finely-carved figure-head which is a portrait of Mr. Sergei Witte, the Russian Minister of Finance, after whom the vessel is named. She has also very luxurious accommodation for about 12 first-class passengers, 20 second-class, and a large number of steerage passengers. On the trial trip the owners were represented by their English agent, Mr. A. Alliman, of London.

Teuton.—On August 5th, the steam trawler *Teuton*, built by Messrs. Cook, Welton, and Gemmell, of Hull, and engined by Messrs. Crabtree & Co., of Yarmouth, built to the order of Mr. T. Robinson, Grimsby, went on her trial as far as Withernsea. There was a strong wind and a heavy sea, but the vessel and engines behaved well, making a speed of about ten knots.

Juno.—On August 6th the new steamer *Juno* which has just been built and engined by Messrs. Wigham Richardson & Co., for the Russian Steam Navigation and Trading Co., of St. Petersburg and Odessa, went for a very successful trial trip off the coast. The steamer is 357 ft. long by 46 ft. beam, and is fitted with engines and boilers of Messrs. Wigham Richardson & Co.'s own manufacture, which on the trial trip worked without the slightest hitch, driving the fully laden vessel at a speed of over 11 knots per hour. The arrangements for working both the ship herself and the cargo are of the most modern and improved description. The owners were represented on the trial trip by Capt. Trenert and Mr. Nevins, under whose superintendence the vessel has been constructed, and immediately after the trial, the steamer sailed for Odessa.

Rask.—On Saturday, August 6th, the fine new steel cargo steamer *Rask*, built by Laxwaags Engineering and Shipbuilding Co., Bergen, Norway, went on her trial trip. The ship is built to the order of Mr. John Thorsen, Haugesund. She has been built to Norwegian Veritas highest class and is of the following dimensions:—Length extreme, 235 ft.; breadth, 32 ft.; depth, moulded, 15 ft. 8 in. She is 1,012 brutto registered tons. The engines are of the triple-expansion type, about 560 I.H.P., and the average speed 10½ knots. The vessel has a steel deck and double bottom for ballast and peak tank abaft. Otherwise, she is equipped most comfortably, and has a large deck for timber, steam windlass, steam steering apparatus, and three strong steam winches. The main stop valve on the boiler is provided with Mr. Bower's patent rapid closing apparatus, from deck as well as engine-room. This proved to be most excellent. The vessel and her machinery has been built under the superintendence of Mr. Valintinsen of this city, and there were present on the trial trip the owner, Mr. Thor n and the managing owner Mr. Stolz Nielsen, and a large company of ladies and gentlemen. After the trial, which was in every way a complete success, the vessel proceeded the next morning under the command of Captain Smedsvig to Sweden to load for her first voyage to Copenhagen. The vessel was finished four days before the specified contract time. The trial was made in the finest of weather, and was much enjoyed after the long period of wet weather.

Marie Suzanne.—On August 10th the fine steel screw steamer *Marie Suzanne* had her trial trip in Hartlepool Bay. The *Marie Suzanne* has been built by Messrs. Wm. Gray & Co., Limited, West Hartlepool, to the order of Messrs. Rodocanachi, Sons & Co., of London. She takes Lloyd's highest class; her length over all is 341 ft.; breadth, 48 ft. 1 in.; and depth, 24 ft. 1 in. The hull is built on the deep frame system, with a cellular double-bottom. The engines are of the triple-expansion type, supplied by the Central Marine Engine Works, of Wm. Gray & Co., Limited, the cylinders being 24 in., 38 in., and 64 in. in diameter respectively, with a piston stroke of 42 in. Steam is supplied by two large steel boilers working at a pressure of 170 lbs. per square inch. Mr. Fickling, one of the managing owners, together with Mr. Birchby, who has superintended the building of the ship and her machinery, represented the owners; Captain Hodgson was in command of the vessel; Captain Murrell represented the builders of the ship, and Mr. W. C. Borrowman and Mr. James Lindsay the builders of the engines; there was also a large party of visitors, including many ladies. The vessel was put through the usual manœuvring to test her capabilities and the running of the engines, everything going off to the satisfaction of those present. After discharging her visitors the *Marie Suzanne* at once proceeded to Leith, where she takes in a cargo for South America.

Arminza.—On Friday, August 12th, the fine steel screw steamer *Arminza* built by Sir Raylton Dixon & Co., Limited, Cleveland Dockyards, Middlesbro', to the order of Senor Ramon de la Sota of Bilbao, was taken out to sea for her official trials. Her principal dimensions are:—Length, 299 ft.; beam, 42 ft.; depth, moulded, 20 ft. 3 in. She is built to Lloyd's highest class partial awning deck rule, and has a deadweight carrying capacity of about 3,500 tons on a light draught of water. Triple-expansion engines have been fitted by Messrs. Blair & Co., Limited, of Stockton-on-Tees, having cylinders 22½ in., 36½ in., 60 in., by 39 in. stroke with two large single-ended boilers working at 160 lbs. pressure. The vessel has been constructed under the personal supervision of Captain Luis de Ybarra, and is a sister ship to the *Plencia* lately built by Sir Raylton Dixon & Co., Limited, for the same owner. The trials were most successful and gave every satisfaction to the owner's representatives.

Moorgate.—On August 13th this vessel was taken on trial and a mean speed of 10½ knots was obtained, the engines running smoothly throughout and there being an ample supply of steam. The vessel has been built by Messrs. Joseph L. Thompson & Sons, Limited, of North Sands Shipbuilding Yard, Sunderland, to the order of Messrs. The Dowgate Steamship Co., Limited, London, of which Mr. W. H. Dillon is the managing director. Her principal dimensions are:—Length, between perpendiculars, 325 ft.; breadth, extreme, 45 ft. 6 in.; depth, moulded, 26 ft. 4 in. She has been built to Lloyd's highest class on the single-deck rules, and is the third vessel Messrs. Thompson have built to the order of Mr. Dillon. The vessel has been constructed under the supervision of Mr. John Crookson, of London.

Hiso.—On Monday, August 15th, the steamer *Hiso* left the shipbuilding yard of Messrs. Short Bros. for trial trip, which proved in every way satisfactory. After adjusting compasses, a series of runs was made over the measured mile, when a mean speed of 11 knots was attained. The vessel has been constructed of steel to the Det Norske Veritas rules, for C. T. Boe, Esq., of Arendal. Her dimensions are:—Length, 255 ft.; breadth, 36 ft. 9 in.; depth, moulded 20 ft. 4 in.; with a deadweight carrying capacity of 2,550 tons. Her engines are by Messrs. William Allan & Co., Limited, of Sunderland, the cylinders being 19 in., 31 in., 51 in., by 36 in. stroke, the working pressure being 160 lbs. After the trial trip the vessel proceeded to Archangel to load timber, under the command of Captain Pedersen.

Euryalus.—On August 16th the s.s. *Euryalus*, a finely modelled steel screw steamer, which has been built by Palmer's Shipbuilding and Iron Co., Limited, Jarrow-on-Tyne, to the order of Messrs. A. Currie & Co., of Melbourne, was taken to sea for her official steam trials. Her dimensions are:—Length, 360 ft.; breadth, 45 ft. 6 in.; depth, 26 ft. 9 in. The vessel has been built under special survey to take Lloyd's highest class, and is of the three-deck type with a poop, bridge and topgallant forecastle, and has two iron decks laid all fore and aft. The upper and main decks are fitted in a manner suitable for carrying horses, the upper deck is left clear under the bridge, and the winches are fitted on winch platforms, so as to provide as much clear space for horses as possible. Accommodation is provided for the officers and about 20 passengers in a long range of steel deckhouses on the bridge-deck, alongside the engine and boiler casing, and over the deckhouses a boat and promenade deck is fitted and extended to the ship's sides, and supported from the bridge-deck by stanchions. The accommodation for the seamen, firemen, and cattlemen is provided in the poop and forecastle. The vessel is rigged as a two-masted fore-and-aft schooner, and is fitted and finished as a first-class cargo, passenger, and cattle steamer, and is designed to load about 4,850 tons deadweight, on a mean draught of 22 ft. 6 in. The engines, which have also been constructed by the Palmer Co., are of the triple-expansion surface-condensing screw type, with cylinders 27 in., 45½ in., 74 in. by 48 in. stroke, steam being supplied by two boilers, 16 ft. diameter by 12 ft. long, with a working pressure of 180 lbs. and fitted with Howden's forced draught. The engines are fitted with all the latest improvements, including:—Weir's pumps and heaters, Aspinall's governor, Harris's filter, Bumstead & Chandler's fan with two engines, See's ash ejector, etc. The vessel was put through a six-hours trial, and during the whole of this time the machinery worked in a thoroughly satisfactory manner, the average speed being 12½ knots, with 68 revolutions per minute. The vessel was fully loaded, and after the trial proceeded on her voyage. The vessel and machinery were built under the supervision of Mr. F. J. Trewent, of London, assisted by Mr. Proctor.

Therese.—On Wednesday August 17th the fine steel screw steamer *Therese*, built by Sir Raylton Dixon & Co., Limited, Cleveland dockyards, Middlesbrough, to the order of Mr. Martin Carl, of Copenhagen, was taken out to sea for her official trials. Her principal dimensions are—250 ft., by 35 ft. 6 in. by 19 ft. moulded. She is built to Lloyd's highest class, single-deck rule, having poop, bridge and forecastle, and deadweight capacity of about 2,000 tons on a light draught of water. Triple-expansion engines have been fitted by Messrs. George Clarke, Limited, of Sunderland, having cylinders 18 in., 29 in., 48 in., by 33 in. stroke with one large boiler working 160 lbs. pressure. The vessel has been constructed under the personal supervision of Captain Knudsen, and is a sister vessel to the *Elna*, lately built by Sir Raylton Dixon & Co., Limited, for the same owner. After the trials, which passed off most satisfactorily, the vessel proceeded to Blyth to load for Copenhagen.

Kenmore.—On August 17th the new steamer *Kenmore*, built by Messrs. Charles Connel & Co., to the order of Messrs. James Gardiner & Co., Glasgow, went down the river on her official trial trip, with a large company on board. The trial was most satisfactory in every respect, and the machinery, which was fitted on board by Messrs. Dunsmuir & Jackson, Govan, gave the usual satisfactory results.

H.M.S. Diadem.—On August 17th, her Majesty's cruiser *Diadem* returned to Portsmouth Harbour from a 60 hours' steam trial in the Channel. A speed of 16·8 knots was obtained, the H.P. developed was 8,510·4, and the coal consumption for all purposes was 2·01 per I.H.P., per hour.

Beaufort.—On August 19th the s.s. *Beaufort*, pilot cutter, went on her trial trip down the river, when a mean speed of 11·3 was attained, the guarantee being 10 knots. She was built at Rutherglen by Messrs. T. B. Seath & Co., and engined by Messrs. Fisher & Co., Paisley.

Taboga.—On Tuesday, August 23rd, the screw steamer *Taboga* which has just been built and engined by Wigham Richardson & Co., at their Neptune Works, Newcastle-on-Tyne, to the order of the Pacific Steam Navigation Co., of Liverpool, went for a very successful trial trip off the Coast. The *Taboga* is destined for service on the West Coast of Central America, she is built of steel, is 185 ft. long, by 31 ft. beam, and is rigged as a two-masted schooner. She has very well finished accommodation for 22 first-class passengers in 11 state-rooms, all of which are in deck-houses on the promenade deck, and special attention has been paid to all arrangements for securing the comfort of the passengers. There are also arrangements for carrying a large number of cattle on the main deck. The steamer is fitted with compound engines, which on the trial trip worked without the slightest hitch, and to the entire satisfaction of the owners representatives, Captain Conlan, their marine superintendent, Mr. James Thomson, their superintendent engineer, and Captain Taylor, who will take command of the vessel.

Princess Louise.—Lately, Messrs. Ritchie, Graham & Milne, Whiteinch, have completed a steamer, named the *Princess Louise*, for Captain Alexander Paterson, Oban. The vessel, which is 100 ft. long, 17 ft. broad, and 8 ft. deep, moulded, has been built under Lloyd's and Board of Trade survey for passenger traffic in connection with the Callandar and Oban Railway. On the measured mile a speed of 11 knots was attained. After the trial the vessel left for Oban, going by the Mull of Cantire, and on the run did a distance of 133 knots in 13 hours against a heavy sea.

Yacona.—The steam yacht *Yacona*, recently launched from Messrs. John Scott & Co.'s shipyard for Mr. W. S. Bailey, commodore of the Royal Yorkshire Yacht Club, went on her official trial trip from Burntisland Roads. The results were highly satisfactory, a speed of 14 knots on the measured mile being obtained. There was a large party on board, and, the weather being fine, a very pleasant day was spent. The *Yacona* is a steel screw yacht, length, 188 ft.; breadth, 27 ft.; depth, 11 ft. 2 in., and has a Thames measurement of 635 tons. She has been supplied with electric light by Messrs. Holmes & Co., Newcastle and Glasgow; steam windlass by Messrs. Harfield & Co.,; and steering engine by Messrs. Alley & M'Lellan. The propelling machinery was supplied by the builders, and was sufficiently powerful to drive the *Yacona* from Burntisland to Hull in 17 hours.

Hector.—Lately, the s.s. *Hector*, recently built to the order of Messrs. J. & P. Hutchison, Glasgow, by the Irvine Shipbuilding & Engineering Co., Limited, went on her trial trip. There was a large company on board, and the vessel, after adjusting compasses, ran the measured mile with satisfactory results, attaining a speed of 10¾ knots, being 1¼ knots in excess of guarantee. The owners expressed themselves highly satisfied with both vessel and machinery. The vessel is 165 ft. by 26 ft. 6 in. by 14 ft. moulded to main deck. Her gross tonnage is 507, with registered tonnage 78, and she carries 650 tons deadweight on Lloyd's freeboard. The vessel was supplied by Messrs. McKie & Baxter, Govan, with compound surface-condensing machinery, having cylinders 18 in. and 40 in. in diameter by 33 in. stroke, steam being supplied by a steel boiler 13 ft. 6 in. in diameter by 10 ft. long, and 130 lbs. working pressure.

Duke of Cornwall.—Lately the new twin-screw steamer *Duke of Cornwall*, the latest of a series of Channel steamers built at the new construction works at Barrow-in-Furness, has completed at Fleetwood a series of searching trials with satisfactory results. These tests were conducted under the ordinary working conditions with a weight equivalent to service load, and included a run on natural draught between Fleetwood and Belfast and back, and a similar round trip with the boilers working under forced draught conditions. These are the trading points, the vessel being owned jointly by the London and North-Western and the Lancashire and Yorkshire Railway Companies. The *Duke of Cornwall* is 325 ft. long, 37 ft. beam, and 17 ft. 6 in. depth, the gross tonnage being 1,540 tons, and on trial her draught was 12 ft. 3 in. The ship has a saloon arranged full width of the main deck, with state cabins forward and aft on either side. A large number of valuable horses cross the Channel, and the company lay themselves out for specially protecting these, and thus luxuriously padded horse-boxes and stalls are provided in the after end of the ship, where also the cattle attendants have special cabins. The engines have been designed by Mr. James M'Kechnie, the engineering manager at Barrow, and are of the high speed type associated with fast cruisers, of which he has had long experience. There are four cylinders arranged for three stages of expansion. The high pressure cylinders are 22½ in., the intermediate 34 in., and in each engine there are two low pressure cylinders of 38½ in. in diameter, the stroke in all cases being 33 in. There are four boilers, single-ended, each having four furnaces. The boilers are 15 ft. 3 in. in diameter, and 11 ft. long.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

NUMBER OF STOKERS FOR WATER-TUBE BOILERS.

To the Editor of THE MARINE ENGINEER.

SIR,—I observe in the MARINE ENGINEER of the current month Mr. William Lawrie's letter on the above subject, and as Mr. Lawrie has stated that he based his views partly on my authority, I feel it is but right that I should give some particulars to show that Mr. Lawrie is quite correct in stating that more men are required for water-tube boilers than for cylindrical boilers of the same power. Of course I must say that, in speaking about water-tube boilers, I refer to the Belleville type, as these are the only water-tube boilers with which I have been at sea.

There are in our fleet three vessels practically of the same size, and generally steaming with the same power. One is fitted with Belleville boilers, namely, *Kherson;* the other two, *Petersburg* and *Saratov*, with ordinary cylindrical boilers.

The number of men actually employed on the voyages to the Far East are as follows:—

		Machinists.	Stokers.	Helpers.	Total.
Saratov	..	16	30	17	63
Petersburg	..	16	30	17	68
Kherson	..	22	34	18	74

During the maiden voyage of the *Kherson* we found that the number of stokers was not sufficient to carry out all the work, and, accordingly, 4 stokers and 2 helpers were added. As the result of our experience with the *Kherson*, we are now getting for our new steamer, the *Moskoa*, 22 machinists, 38 stokers, 27 helpers, 87 total.

The necessity of keeping more stokers with the Belleville boilers depends upon the following points:—

1. Coal consumption is higher than with Scotch boilers. The difference was at least 10 per cent. in the case of Welsh coal, and sometimes 30 per cent. when using Japan and other smoky coals.

2. Firemen's work is harder because firing must be continuous, and the fires cleaned oftener. The result is that intervals between work and rest are short, and a man has practically no rest during the watch.

3. Extra work for firemen on account of cleaning tubes when under steam, and putting boilers in order after steaming.

Further, there are more mountings and small parts, more brickwork, &c., all of which require attention and labour.

As can be seen from the above figures, the number of machinists is greater in the case of the *Kherson*. We were obliged to keep more of them owing to the larger number of joints in the boilers, and also on account of a greater amount of auxiliary machinery and the more or less complicated apparatus in connection with the boilers, viz., feed-pumps, air-blowers, automatic feed-regulators, blow-off apparatus, reducing valves, &c.

To keep all the above items in order, unceasing work by the machinists in charge of the boilers was necessary.

I am,
Yours faithfully,
J. GRETCHIN.

Helensburgh,
August 17th, 1898.

REDUCTION OF WEIGHT IN VARIOUS ENGINES AND BOILERS.

To the Editor of THE MARINE ENGINEER.

SIR,—With reference to a statement attributed to M. Normand, and contained in the July number of the MARINE ENGINEER, that the reduction of the weight of any part of a ship allows the whole displacement to be reduced by about four-and-a-half times the weight, I would feel favoured if you could procure and insert in your valuable paper data to prove the above.

Yours sincerely,
A MARINE ENGINEER.

Dumbarton
August 20th, 1898.

[The statement of M. Normand was made in his paper on "Feed-water Heaters," read before the Institution of Naval Architects. The statement was endorsed by all the leading naval architects at the time, and there can hardly be any question of its being correct. However, we hope to deal with the matter at an early date.—ED. M.E.]

Reviews.

Heat Efficiency of Steam Boilers: By Bryan Donkin. Charles Griffin & Co., Limited, 1898.

MR. BRYAN DONKIN and Professor A. B. Kennedy conducted a long series of boiler trials, and when they published the results they conferred on the engineering reading public a boon. In writing this new volume on the efficiency of steam boilers, Mr. Bryan Donkin has placed the engineering public under a further obligation.

The first chapter is devoted to a classification of the types of boilers. These the author places in two main divisions—i. internally fired boilers, ii. externally fired. Under the former heading are the Cornish, the Lancashire, double-ended marine, and agricultural boilers. Under the second heading he groups an ordinary cylindrical boiler with return flues, and Lancashire with external grate, elephant boilers and water-tube boilers. Chapter II. explains the contents of the columns of records of tests given in chapter III. There are 26 columns of numbers, the records of tests. Column i. gives the total heating surface of the boiler tested in square feet. Columns iii. and iv. the general dimensions of the boiler in length and diameter. Column v. shows the amount of vacuum or draught in the chimney. Column vi. gives the grate area. Heat efficiencies are given in columns vii., viii. and ix., the steam pressure is given in Column x. Columns xi. and xii. give the temperature of the furnace gases. Columns xiii., xiv. and xv. give the analysis of the gases in chimney. The lbs. of water evaporated per hour are given in Column xvi. Column xvii. gives the evaporation per lb. of coal from and at 212 per cent. Columns xix., xx., xxi. and xxii. give fuel. Column xxii. gives the quantity of air admitted. Column xxiv. the year of the test.

In none of the trials has there been a graduated series showing the admission of air and the effect of it on the quantity of C.O present. Nor has there been graduated trials to show what quanitity of air gave the best result. Nor has there been in any of the trials the temperature of chimney when the feed-water heater was on and when it was off. On the whole there is a great deal of valuable information given in the records of the trials.

In Chapter IV. firegrates are discussed. The author gives the rule that the quantity of air admitted should be from 30 to 50 per cent. in excess of that required by theoretical consideration. But the author does not tell us that the quantity of air necessary for the best evaporation is a function of a great many things—the draught, the form of boiler, etc. The different kinds of grates for rapid consumption of fuel are discussed, and the method of use for getting over the trouble of the bars melting. The author gives an instance of a Tenbrink grate which is arranged in steps set in a large furnace tube and inclined at an angle of about 45 degrees. Air is admitted both above and below the fire, and the supply regulated. In a comparative trial made by M. Burnat, in Alsace, in 1875, and an ordinary grate, both burning the same poor coal, the Tenbrick gave 35 per cent. more evaporation. The grate of Mr. Mumford's boiler is not given, nor any account of the easy way he manages to get a consumption of 70 lbs. of coal per square foot, without injury to the bars. In Chapter V. descriptions are given of the different kinds of stokers—Vicars, Bennis, Juckes, McDougal, Hodgkinson, Leach, Henderson, Proctor, Cass, Whitaker, etc., and the general advantages and disadvantages of stokers are discussed. The author thinks they would be invaluable at sea, especially in hot climates, where the discomfort to men in the stokehold is very great. Chapter VI. is devoted to combustion. In this the author rightly cautions designers of boilers against having the heating surfaces too close to the grate so that the gases may be chilled too soon. The author, says further, that "the boiler plates when clean are only a few degrees hotter than the water in the boiler and seldom higher in temperature than say 400° Fah., while the temperature of the flames is from 1,850° Fah. to 2,700° Fah." Which shows that the author is in touch with the latest opinions on the transmission of heat through plates. The heating value of fuel is next discussed, and the formula the author uses is—

$$14{,}650\,C + 62100\,(H - \tfrac{1}{8}O).$$

The author goes on to consider the products of combustion and the loss due to C.O. being sent to the chimney, and he quotes a very important statement made by Mr. Hoadley: "Unless the composition of the escaping gases is known, nothing is known; these accurately ascertained, and their weight and temperature, almost everything which it is desirable to know is ascertainable." Perhaps the most new and interesting part of the book is page 139, where an account of Mr. Spencer's experiments on the regulation of admission of air to the furnace is given. In these experiments the quantity of air admitted is varied, and the efficiency of the boiler noted. In the first series chimney draught is used, and air at ordinary temperature. The admission is from 12¼ lbs. to 12½ lbs. per lb. of coal. The efficiency rises from 65 per cent. to 75 per cent. In the second series forced draught and air at ordinary temperature is used. The quantity admitted was from 18½ lbs. to 27 lbs. per lb. of coal. The maximum boiler efficiency was 68 per cent. In the third set the same kind of air was used with forced draught, and from 17 to 23 lbs. admitted per lb. of coal. The maximum (75¾ per cent.) was reached when the admission was 20 lbs. of air per lb. of coal. Chapter VII. is very valuable, being a record of the experiments made in respect to the transmission of heat. These experiments are not new, and they have been recorded in other books on steam boilers. The results of the five experiments on the Northern Railway of France are given, also Blechynden's, Durston's, and Hirshe's experiments, and the effect of the nerves or ribs of serve tubes gone into. The author offers no theory to explain the transmission of heat, and he wisely abstains from giving any formulæ. In Chapter VIII. feed-water heaters are dealt with, and the best known economisers described.—Green's Pimbley's, &c. and a heat balance sheet is given showing the effects of the economiser. Chapter IX. is on the question of smoke prevention, and the author gives us an interesting smoke scale employed by Colonel Gressly:—

0 = No visible gases.
¼ = White transparent vapour.
½ = Light brown smoke.
1 = Brownish grey smoke.
2 = Dense smoke.
3 = Thick black smoke.

The author records several Smoke Abatement Commissions. Chapter X. supplies a number of methods for analysing gases and describes the apparatus. Fuel calorimeters are also described here as well as super-heating calorimeters. Marine and locomotive boilers are taken up in Chapter XI. Here, stoking and draught are first taken, and then feed-water heaters. In this part, there is a quotation from Professor Cotterill in *Engineering*, 1890, pp. 527. He says:—"If the steam, instead of being taken from the reservoir, were taken from the boiler, the feed-water might be raised to the temperature of the boiler, but the loss of work which might have been done by the condensed steam would exactly compensate for the saving of heat, so that the process on the whole would be neither a gain nor loss." Which is exactly found now not to be true, since the statement fails to take into consideration the effect of circulation and the point of ebullition. This section, unfortunately, fails to give an explanation of the live steam feed-water heater, which is becoming more popular every day in consequence of its easy manipulation The Babcock and Wilcox water-tube boiler is described, also the Niclause, Normand, Thornycroft, Yarrow, and various others. In Chapter XII. the author advocates the establishment of coal testing stations, and explains a number of this and Foreign Goverment trials. On page 223 a graphic diagram is given, showing variations in boiler efficiency with different rates of evaporation per square foot of heating surface, and on the next page but one a diagram to show the loss of heat due to different amounts of CO_2. There is an extensive appendix and a very useful bibliography. Also a great number of very good plates with figures of steamboilers, furnace-flues, etc., and the work finishes with an excellent index.

The book is octavo, of 311 pages. The records of the results of experiments are excellent, and as has been said, it has a number of excellent figures of boilers in plates at the end. There are a number of new points raised on the boiler question, although we are sorry to see that the livesteam feed-water question, and the transmission of heat through plates' question have not been attacked. On the whole, the book is an excellent treatise on steam boilers, and we can commend it to our readers as a perfectly safe book for them to study this branch of construction.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from June 14th to July 2nd, 1898.

13113 A. J. Boult. (The Bielefelder Maschinenfabrik vormals Durkopp and Company, Germany.) Lubricators.
13144 W. H. Harfield. Engines.
13151 A Krefting. Organic products for seaweed.
13155 F. Edwards. Pumps.
13159 W Waller. Fittings for water-gauge tubes.
13173 N. G. K. Husberg. Steam turbines.
13216 J. Roberts. Unloading ships.
13233 S. Fox and Hartley and Sugden, Limited. Boilers.
13271 W. Ruston, T. J. Haile and H. Sherras. Valves.
13279 R. Rhoné. Sails.
13289 A. Krefting. Organic products from seaweed.
13290 W. P. Thompson (F. W. Spacke, United States). Steam engine governors.
13311 E. S. Prentice. Gauge for measuring water.
13328 W. H. Watkinson. Steam generators.
13334 C. Moller. Submarine torpedo-boats.
13342 H. A. Harvey. Preservative composition for ships' bottoms.
13361 L. W. Stevens. Surf boats.
13394 E. J. Preston, J. Gillies and W. R. Hayes. Ships' side lights.
13403 W. Sutcliffe and J. Horne. Piston-rod packing.
13409 W. D. Mould. Boiler.
13425 J. Lumb. Lubricating bearings.
13437 D. R. Smith. Reciprocating propeller.
13498 W. M. Musgrave. Compound steam engines.
13501 J. Sampson. Water-tube steam generators.
13514 J. Nutting. Regulators for boiler feed.
13544 A. Van Bibber. Harbour and coast defence.
13545 J. Harris and H. Newham. Pulley blocks.
13551 G. Scott. Discharging ships' cargoes.
13557 L. T. B. Saunderson. Telephone cables.
13566 J. H. C. Lenty. Salvage and collision mats.

13569 J. H. Barker. Joining electric cables.
13586 G. C. Allingham and W. Fennell. Electric cables.
13587 E. A. Ashbury and T. Whitmore. Propeller for steamships.
13596 W. J. Fieldhouse. Sleeping berths.
13610 A. Coats, jun. High-speed steam engines.
13614 W. Butler. Distributing oil from tanks.
13647 J. Hopkinson and J. Hopkinson & Co., Ltd. Guards for water gauges.
13681 J. P. Hall. Pumps.
13691 W. H. Bushel. Valves for steam engines.
13696 T. Tomlinson. Internal combustion engines.
13719 E. B. Caird and T. J. Rayner. Utilising exhaust steam.
13733 E. H. O. R. Ropner. Passenger vessels.
13759 G. C. Allingham and W. Fennell. Cables.
13764 W. Spink. Indicating a ship's course at sea.
13808 G. G. M. Hardingham (Felten and Guilleaume, Germany,) Cables.
13816 J. H. Parsons. Alternating piston rotary engines.
13819 W. P. Thompson. (C. J. Schuster, United States.) Automatic governor.
13853 R. McM. Hasluck. Plummet for fishermen.
13871 W. J. Brewer. Reducing friction of bearings.
13948 E. M. Waind. Funnels.
13976 J. H. Lancaster. Dredges.
13996 J. C. Falconer and C. Berry. Towing ships.
14042 A. Johnson. Stanchions for fishing vessels.
14091 S. Ellsch. Measuring funnels.
14094 J. C. Hudson. Steam pumping engines.
14121 R. C. G. Staats and W. Coates. High-water indicator.
14128 H. Maxim. War vessels.
14133 E. B. Caird and T. J. Rayner. Float feed apparatus.
14141 S. Drzewiecki. Torpedo launching apparatus.
14178 T. Messenger and A. A. Whitlock. Boilers.
14186 W. Bettis. Driving gear for boats.
14238 W. Lede. Boilers.
14242 A. Lefargue. Steam generators.
14274 C. Lockwood. Metallic packing for pistons.
14286 W. P. Thompson (G. Beissbarth vormals F. Loos, Germany). Lubricators.
14339 G. N. Berwick. Steam boilers.
14368 W. Styles. Rowlocks for boats.
14371 Simpson, Strickland & Co., Limited, and W. Cross., Stern gear for screw vessels.
14387 E. B. Donkin. Rotary pump apparatus.
14403 J. F. A. Carobine. Life belt.
14419 A. B. Collis. Water-tube boiler.
14442 R. Crabtree. Sea fishing.
14443 J. I. Booker. Flanging the ends of furnace flues.
14526 G. S. Munro. Sail hank.
14530 F. E. Bright (J. R. Blakeslee, United States). Upsetting boiler tubes.
14544 B. H. Jones. Concrete foundations for piers.
14607 T. Muckalt. Propulsion of machinery.
14619 W. P. Thompson (A. Brechot, France). Improving furnace draught.
14639 H. J. C. and J. A. Pattison. Steam generators.
14643 J. Briggs. Floats used with trawl nets.
14690 J. Wylie. Cargo-discharging apparatus.
14737 J. Oliver. Heating feed-water for steam generators.
14762 J. Morris. Cross tubes for vertical boilers.

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BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

Extra First Class.

July 23rd, 1898.—	Carnaghan, James.	Ex.1C	North Shields
" " "	Firth, Harry J. ..	Ex.1C	Hull.
" " "	Laslett, Chas. F...	Ex.1C	London
" " "	Ramsay, George ..	Ex.1C	Dundee
" " "	Valder, Arthur ..	Ex.1C	London
" " "	Young, James M.	Ex.1C	Liverpool

June 25th, 1898.

Barr, Daniel ..	2C	Glasgow
Bowman, J. M.	1C	N.Shields
Brass, Chas. E.	2C	W.H'pool
Butcher, James	2C	"
Byrne, Albert D.	1C	London
Campbell, Chas.	2C	Glasgow
Clarke, Percy C.	1C	Liverpool
Corns, Francis A.	2C	London
Corsane, W. H.	1C	Dundee
Cotton, Thos. W.	1C	N.Shields
Dodsworth, J. G.	1C	London
Godbert, A. J. B.	2C	Cardiff
Graham, Wm. S.	1C	Liverpool
Green, John B.	2C	London
Griffiths, Thos.	2C	Liverpool
Guy, William..	2C	W.H'pool
Horn, Geo. W.	2C	"
Howsagoe, F. C.	1C	N.Shields
Hull, J. McK.	2C	"
Jackson, F. J.	2C	W.H'pool
Jenkins, David	1C	Cardiff
Johnston, Arthur	2C	Glasgow
Jones, Wm......	2C	Liverpool
Lace, Chas. Jno.	1C	Cardiff
Law, Wm.	2C	"
Lee, Norman..	1C	London
Leinster, Thos. A	2C	N.Shields
Macrae, Alex...	1C	Liverpool
Moore, Chas. ..	2C	"
Napier, James..	1C	Glasgow
Oliver, James W.	1C	W.H'pool
Pritchard, F. G.	2C	Liverpool
Reece, Wm. E...	2C	Cardiff
Rees, Henry J.	2C	N.Shields
Russell, Jno. ..	1C	London
Sharp, Wm. C.	1C	Glasgow
Sidey, David ..	2C	Dundee
Simpson, A. M.	1C	Glasgow
Shone, James ..	2C	London
Tait, Joseph C.	2C	N.Shields
Thorman, W. H.	2C	W.H'pool
Warden, David	2C	Glasgow
Wilson, Geo...	2C	Liverpool

July 2nd, 1898.

Anderson, W. G.	2C	London
Blackey, Thomas	1C	Liverpool
Bradley, Wm. V.	2C	London
Branch, Samuel	2C	S'nd'rl'nd
Bryant, Isaac W.	2C	Liverpool
Brawn, Wm. G.	2C	"
Cameron, H. R.	1C	S'nd'l'nd
Christie, John..	1C	Aberdeen
Clarke, Chas. ..	1C	Liverpool
Fea, John E. ..	2C	Hull
Fitzpatrick, D.	2C	Liverpool
Goodyear, W. C.	2C	London
Grant, R. M. ..	2C	Aberdeen
Hepton, E. S...	2C	Hull
Kinnear, Wm. G.	2C	S'nd'land
Lightfoot, J. S. T.	2C	Liverpool
Marshal, James	2C	Aberdeen
Maybury, John	2C	Liverpool
Murray, S. A...	2C	Aberdeen
Rowles, Thos..	2C	Bristol
Sfaello, N. G...	2C	S'nd'land
Simpson, R. G.	1C	London
Sinclair, Wm. ..	2C	Aberdeen
Smith, James..	1C	London
Stephen, Wm...	2C	Aberdeen
Taylor, James..	1C	London
Withers, Edgar	1C	Bristol

July 9th, 1898.

Amery, Jno....	1C	London
Anderson, A. E.	2C	N.Shields
Barrie, Wm. ..	1C	Glasgow
Black, Amos E.	2C	London
Black, Wm. H.	1C	"
Borwick, E.....	2C	N.Shields
Briceland, A. ..	2C	Glasgow
Brown, John ..	2C	"
Bryce, Robt. ..	1C	"
Clode, Eason J.	1C	Cardiff
Collins, H. E...	1C	"
Craig, Robt....	2C	Liverpool
Currie, Archd..	1C	Glasgow
Davies, David..	1C	Cardiff
Davies, Saml. E.	2C	"
Dixon, C. H. ..	1C	London
Doherty, Chas.	2C	Liverpool
Ewing, Robt. R.	2C	"
Faid, John	2C	Glasgow
Fife, Geo. J. ..	1C	London
Forsyth, Wm...	1C	"
Gemmill, James	2C	Glasgow
George, Wm. ..	2C	Cardiff
Haglett, Geo. J.	1C	London
Hawkins, W. R.	1C	Cardiff
Hewson, Wm...	2C	N.Shields
Hindson, T. E.	2C	Liverpool
Hughes, Robt. G.	1C	"
Hutchison, W.	2C	N.Shields
Jackson, H.....	2C	"
Jamieson, Wm.	2C	"
Jenkins, D. F...	1C	Cardiff
Kelly, F. H....	1C	London
MacLean, W. E.	1C	Liverpool
M'Cutchion, A.	1C	Glasgow
Meiklejohn, R. W	1C	Liverpool
Melville, Isaac	2C	N.Shields
Mitchell, J. H. R.	2C	"
M'Vean, D. C.	2C	Glasgow
Nixon, Robert..	1C	N.Shields
Owen, T. W. A.	2C	Falmouth
Rees, Mansel ..	1C	Cardiff
Rogers, Wm. ..	2C	Liverpool
Smith, John M.	1C	N.Shields
Taylor, E. H. ..	2C	Cardiff
Thomas, W. S.	2C	"
Tysoe, Edward	1C	"
Wainewright, W.	1C	N.Shields
Winchester, A. B	2C	Liverpool

July 16th, 1898.

Alison, James	1C	Leith
Anderson, John	2C	"
Barclay, Gavin	2C	Greenock
Blackie, A. L.	1C	London
Bolton, Thos. H.	2C	N.Shields
Boyton, A. J...	2C	London
Brown, A. H...	2C	Leith
Burberry, H. ..	2C	Hull
Chisholm, R. J.	2C	N.Shields
Douglas, Joseph	1C	London
Duncan, David	2C	Greenock
Dunn, John....	1C	"
Ewin, Alex. D.	2C	Liverpool
Fergus, Alexr...	1C	Greenock
Galston, Thos..	2C	Liverpool
Glaister, Robt.	1C	"
Heslop, Thomas	2C	N.Shields
Holden, James	1C	Liverpool
Howdin, Henry	2C	Hull
Ireland, Wm. S.	2C	Leith
Jones, Alfred ..	2C	N.Shields
Jones, Owen T.	2C	Dublin
Latto, John....	2C	Greenock
Lewis, Edgar ..	1C	N.Shields
McKay, J. G. ..	2C	London
M'Lintock, Wm.	2C	N.Shields
Murray, Alex. I.	1C	Liverpool
Nelson, Charles	2C	London
Orr, Wm.	1C	Greenock
Osborn, Percy..	1C	London
Ping, Frank J..	2C	Greenock
Porteous, John	2C	"
Ragg, Robert F.	1C	N.Shields
Roberts, Owen T.	2C	Liverpool
Rodger, John ..	2C	London
Russell James..	2C	Liverpool
Schofield, R. A.	2C	Hull
Shearer, Robt..	1C	Liverpool
Sime, Thos.....	2C	Leith
Soulsby, Ernest	1C	Hull
Stewart, H. P..	1C	Dublin
Sutton, Walter	2C	Liverpool
Tate, Thos. G..	2C	N.Shields
Waddell, W. A.	1C	"
Walls, Wm. R..	1C	London
Warren, Joseph	1C	N.Shields
Wilson, A. D...	2C	Leith
Wilson, John H.	2C	Liverpool
Wymer F. W..	2C	Leith

The Marine Engineer.

LONDON, OCTOBER 1, 1898.

IT is still an open question whether the water-tube boiler has come to stay. At any rate it is probable that such types as are already generally known and adopted must be considerably modified, probably in the direction of simplicity, before they can be as satisfactory as the present makers would wish. The multitubular boiler is inseparable apparently from a multiplicity of parts, and multiplicity of parts means increase of troubles, and small failures under wear and tear. To deal with these quickly and effectively will mean an increase of engineering staff, and high evaporative efficiency in a minimum of space will mean constant and careful stoking in small and regular quantities, which will probably require an increase of stokers unless the ordinary staff is to be over-driven. We still think mechanical stoking might be a remedy for this, or alternatively liquid fuel which reduces stoking attention to a minimum. We are undoubtedly on the verge of a serious revolution in the boiler-room and stoke-hold at sea. The introduction of high steam pressure and great evaporative efficiency, with a minimum of weight and of space occupied, offer such a tempting bait to the naval architect, or to the shipowner, in the relief of gross weight and space occupied by dead weights, that these modern improvements are not lightly to be cast aside or disregarded, but both these innovations are bringing with them grave attendant consequences in intricacy of mechanism and increased liability to constant troubles, all of which must greatly increase the demands upon the skill, attention and labour of the engine-room and stoke-hold staff, and is likely to produce a re-action against modern innovations unless met and combatted by further ingenuity for their relief.

THE U.S. Naval Department is not to be outdone by the Britishers' latest record-breaker, the *Turbinia*, but are stated to be producing a new torpedo-boat or destroyer that is to run at forty knots. They have so far copied the *Turbinia* in the introduction of multiple shafts and propellers on each shaft, but, as they hope and believe, have gone one better in having electro-motors direct on each shaft. In this way they hope to obtain the enormous speed of revolution of a rotary motor on each shaft as in the case of the *Turbinia*, but a more economical development of motive power from high-speed balanced engines driving the generating dynamos direct. One advantage they will obtain by this arrangement. The propeller shafts may not be of greater length than will suffice for them just to enter the hull. The electric motors can be readily fitted close to the run of the vessel, and the power from the generators and main engines, placed conveniently in the centre of the vessel, may be carried by the ordinary connecting wires. In this way considerable weight of shafting may be saved and a great deal of the vibration, due to long lengths of shafting revolving at enormous speeds, may be avoided. At the same time, by the introduction of a transformation of the motive steam power into electrical energy, and by the conversion again of that electrical energy into rotation, much power must be lost in such conversions. And it would appear that there is every probability that any saving in economy in the use of reciprocating engines, rather than rotary engines, which are proverbially steam-eaters, may be more than lost again in the multiple conversions between the primary motors and the driven propeller-shafts. However, the experiment is an interesting one, only made possible in late days by the great improvements in electrical generators and motors, and we shall have much pleasure in further watching and reporting upon the undertaking.

MUCH interest will be taken in any account that may come to hand of the actual results of, and analysis of damage caused by, the naval conflict in the American-Spanish war. Very little of such facts as may be read against the efficiency of the American Navy have been allowed to become public, but there is little doubt that the accuracy of the fire of the big guns was much below what might have been expected from practice tests, and that owing to the wildness of the firing and the large quantity of ammunition used, both in the bombardments and naval engagements, in Manila Harbour and outside Santiago, the conquering fleets were very near the exhaustion of their store of ammunition. In conflict with better found and better worked war-vessels or land batteries it is extremely probable that the victorious United States squadrons would have had to retire from dearth of ammunition alone, and without their object being fulfilled. Further, it would appear to be an undoubted conclusion that partially unarmoured cruisers cannot stand for a moment against quick-firing six or four-inch shells. The gunners seem to have been cleared from their guns by shell fire of even comparatively light guns very few of the 12 or 13-inch shells having struck their object at all. The danger of fires resulting from explosion of shells amongst the light wood work and fittings of the upper decks cannot be too much exaggerated. The Spaniards are reported to have said that a fresh fire seemed to follow the explosion of every shell. There is much too much wood-work employed at present on our battleships. A material which will not splinter, and will not burn, must be at once devised for the covering of the iron bulkheads, decks, &c., and for all cabin fittings. It will probably require a naval conflict between two first-class naval powers before the behaviour and character of our modern ironclad navy under fire is at all understood. Modern war navies have still to be put to the test of practice under fire.

In view of the annual dinner of the Institution of Marine Engineers, and in consequence of this being the tenth year of its existence, we are giving a record of its initiation and the leading points of its constitution. The members of the Institution will observe that we are devoting some of our space to their interests each month, and are promoting the cause of the Institution in Board of Trade and Education Departments of the Government.

During the whole of this month there has been but one subject on the lips of every engineer. That all-engrossing subject is the position of the Belleville boiler in the British Navy. It has been a much discussed question, and the interest in it, it had been thought, had died down; but in consequence of the correspondence in our columns from Mr. Lawrie, Superintendent of the Palace Steamers, and from Mr. Gretchin, of the Russian Volunteer Fleet, it has revived as fresh as ever. These letters were written in answer to a point raised in a leading article in this journal on the question of the number of stokers employed in ships of the Royal Navy fitted with Belleville boilers. It was our wish that our readers should be in possession of definite information on the subject. This information has since been obtained from reliable sources, and it has now been placed before our readers. Mr. Gretchin has gone to considerable trouble in giving us the desired information as to the number of stokers required when Belleville boilers are fitted in ships of the Russian Navy, and compared them with the numbers required with cylindrical boilers in sister ships of the same fleet. He has also given reasons why he considers extra numbers of stokers are required, and given the Belleville boiler rather a bad character for consumption of coal, especially bad coal. Contemporaneously there has been other information which has come under public notice bearing on the same question. We are informed by the highest engineering authority of the British Navy that in ships of the Navy fitted with Belleville boilers no more engineers are needed than in those fitted with boilers of the cylindrical type, the same number is required in both cases. The number of stokers and trimmers required is different, because simple firing is not the whole question in the stokehold; the arrangement of the position of the bunkers is all-important. The situation of the bunkers in the ships of the Navy is often quite different to that in the Mercantile Marine, and in consequence of that the number of men engaged in the stokehold may vary. But there is another factor which makes it vary more. Stokers of the Mercantile Marine are supposed to move so much coal per day, and stokers in the Royal Navy are supposed to do likewise, but it does not follow that the amount moved is the same in both cases. There is a difference in the number of stokers employed in the two services, but the number of stokers engaged in consequence of that rule would be the same for Belleville boilers as for those of the cylindrical type in the Navy. When, however, there are similar conditions of bunkers, or, to put it plainer, with coal on the floor of the stokehold, no greater number of stokers are required with Belleville boilers than there are with those of the cylindrical type. This, of course, is in the Navy, and when comparing like things with like conditions. In the Mercantile Marine it may be different, but the facts as to this have not come before us as yet. We promise, however, to obtain for our readers full information on that question also at an early date. The importance of the discussion can hardly be overrated, and has been recognized by our contemporaries. Mr. Gretchin's letter has been reproduced in the columns of the *Engineer* and *Fairplay*, and its contents have been made use of in articles in a number of other papers.

THE "SHELL" TRANSPORT AND TRADING COMPANY.

Sir MARCUS SAMUEL & CO., of 16, Leadenhall Street, London, have faith in liquid fuel, and are fitting with furnaces suitable for burning it the steamers of the Shell Transport and Trading Co. The first steamer built to burn liquid fuel of the Shell Line was the *Trigonia*, which is now on her first voyage. The second, the *Haliotis*, has just been brought round to the Thames from the shipbuilding yard of Sir W. G. Armstrong, Whitworth & Co., and her trial trip was made on Wednesday, the 14th inst. A very distinguished company, interested in the result of the adoption of petroleum as the fuel in Indian and Chinese waters, was on board. In view of the complications which may at any time take place in Eastern seas, Sir John Durston, always alive to take advantage of improvements to the British Navy, was there to represent the Admiralty. The Ocean Steamship Co. was represented by Mr. Alfred Holt, and Mr. A. J. Davison was there for the Anglo-Australasian Steam Navigation Co. The Chinese Mutual Steam Navigation Co. was represented by Mr. Gulland, and Major Jenkins was for the Shire Line of Japanese steamers. The great Japanese line Nippon Yusan Kaisha was represented, so was the Oriental Steamship Co. of Japan, so also the Messageries Maritimes Co., and Colonel Swan came up from Newcastle for Sir W. G. Armstrong, Whitworth & Co.

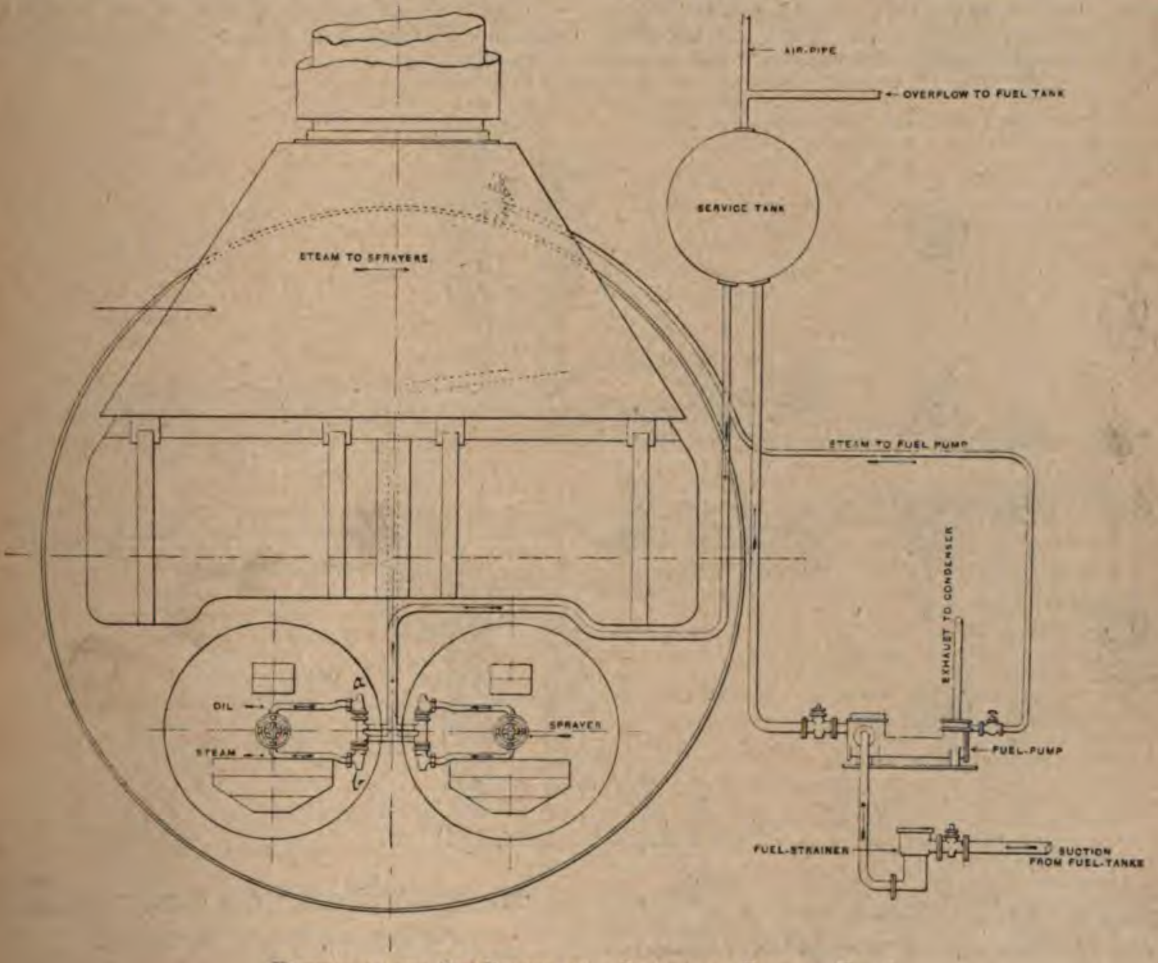
At the beginning, when liquid fuel came fairly under the notice of engineers, it was thought that it would form a good substitute for coal and perhaps replace it everywhere. To prove whether it would be equal to all that was claimed for it an enthusiast in its application was wanted to push it to extremes and fully try how far it could replace coal. That enthusiast was found in Mr. James Holden, of Stratford, and a number of locomotive boilers of the Great Eastern line are fitted with apparatus for burning liquid fuel. The present company of owners of the Shell Line of steamers do not claim that they can substitute liquid fuel for coal in these islands or in English seas. They only claim that they can supply a cheap substitute for coal where coal is dear and poor in quality. It is to the Indian and Chinese seas that the Shell Line of steamers will sail.

Sir Marcus Samuel has bored a number of wells at Balahpappan, on the east coast, in the island of Borneo, In his speech on board the steamer he assured his guests that there was an unlimited supply of oil fuel, and that the company did not intend to compete with coal where coal was cheap, but only with it where it was dear.

The steamer, of course, is built to carry oil fuel, and the tanks in her have all the necessary fittings suitable for this purpose. There are bunkers specially stayed and tested for oil tightness, but if required they can be used for coal. And the compartment between the oil tanks and the stokehold can be filled by coal or water ballast. There is an iron pipe which runs the length of the vessel with a blind flange at the stern for filling the vessel at Batoum. There are three large cargo tanks which together hold 2,000 tons of oil.

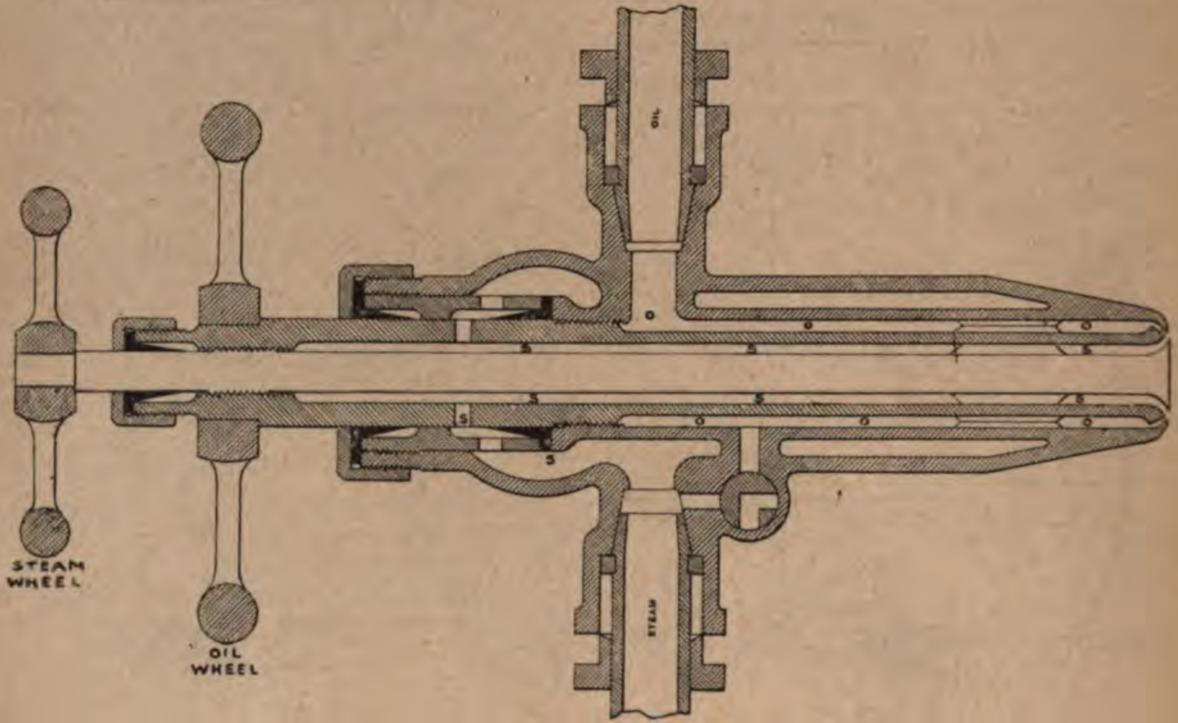
The engines are compound, cylinders with 39-inch stroke. The pressure of steam in the boilers is 100 lbs., the revolutions on trial 64, and the speed 10½ knots. There are two boilers of the return-tube cylindrical type dimensions 12ft. 9in. diameter, 11ft. 3in. in length.

We give drawings of the oil burning apparatus. In Fig. 1 it will be seen that the injector, the end view of which is shown in the middle of the furnace door, is supplied with oil and steam to pulverize the oil. This injector is carried by the oil and steam pipes



FITTINGS OF THE OIL BURNER ON A CYLINDRICAL BOILER. FIG. 1.

acting as hinges, and they can be turned about the joints *a*, *b*. The injector can thus be pulled out of the hole in the furnace door, and when this is done the joints at *a*, *b* act as stop-cocks and turn off both oil and steam. The oil comes through the suction pipe from the fuel tanks, goes through the fuel strainer, fuel pump and service tank, and down through the pipe to the joints *a*, *b*. The boilers in the *Haliotis* have three furnaces 3ft. 2in. diam.



RUSDEN & EELES' OIL BURNER. FIG. 2.

The injector used is Rusden and Eeles' patent. It is of a very simple and effective kind, and its action is easily understood by an examination of Fig. 2. Oil comes into it from the upper tube passage and flows along the annular space *o o o*. Steam comes through the lower tube into the annular space *s s s* and flows along that into the nozzle. The steam it will be seen flows out against the spray of oil, mixes with and pulverizes it. The stream of burning pulverized oil and steam strikes against a fire-brick bridge, the shape of which is an arch supported at the middle on a brick pillar. And the flame splits up there and goes over the top and under the arch, the lower part dividing on each side of the pillar. The quantity of air admitted to the furnace is regulated by the ash-pit door. The brick arrangement can easily be removed and replaced in a very short time by fire-bars and a bridge suitable for burning coal. At 7 a.m. on Monday, the 12th inst., the furnaces were fitted with fire-bars and a bridge for burning coal, and by 11 a.m. on Tuesday the boiler had cooled, and the arrangements had been removed and the brick fittings for oil fuel had been fitted in. The quantity of Newcastle coal used was 2·27 lb. per I.H.P., and the oil used was 1·67 lb. per I.H.P., per hour. The Japanese, Chinese and Indian coal is not nearly so good as English coal, and the relative value of the Borneo oil is much higher than the above ratio. One ton of Borneo oil is worth about 2½ tons of Japanese or Indian coal.

It hardly requires to be pointed out that the use of liquid fuel is a saving of labour in the stokehold. Stokers are often a cause of anxiety to the engineer-staff, and this trouble is almost entirely done away with, as well as the wages bill and maintenance of them to the owners. It is in the Indian Ocean where the advantage will be felt. A steamer burning 20 tons of coal per day will require about 500 tons to steam between the Suez Canal and Singapore, while 300 tons of oil would do the same work, which would leave space for 200 tons more cargo. There are 22 steamers in the Shell Line.

THE DYING-OUT OF THE FRENCH MERCANTILE MARINE.

WHY does the French merchant navy continue to decay, despite bounties? Why cannot France construct ships for her brokers? Why does she fail to pick up cargo, where the British and Germans do, and at ports where her vessels call? The subject, beyond an occasional wail-paragraph in the Press, does not create apparently any sensation in the country. Since sixteen months two Parliamentary Committees have been at work very conscientiously, investigating the whole matter. They, however, arrived at no conclusion, and seem to be forgotten. M. Charles Roux, an authority upon maritime and mercantile subjects, has attested the serious decline of his country's sea-trade. He is to be congratulated for so boldly speaking out, and adducing facts which permit of no illusions. He has startled not a few of his fellow-countrymen by throwing full light upon the dangers threatening the commerce of France. These dangers are the outcome of several official and officious wrongs, that handicap the progress of the French merchant navy and paralyse its efforts to gain ground. The evil grows space, and the time is grave. The Governmental statistics—the latest published—supply a crucial comparison of the state of the mercantile marine of France, for the four months ending 30th April, in the three years 1896-97-98. Omitting the vessels occupied with the home coasting, and the few in the Colonial trade, the number of French ships engaged in the carrying of merchandise outside Europe was, in 1896, 549; in 1897, 506; and in 1898, 640. In a word, while the French gain was but 3¼ per cent., that of foreign countries was 53 per cent. M. Roux attributes the decline of the French maritime navy to the severe competition of the British lines; but that does not prevent the mercantile marines of Germany and of Norway from progressing and surpassing France. He affords perhaps a better solution in his statement that 70 per cent. of the sailing vessels, and 61 of the steamers, were between ten and forty years of age.

The State votes 11,000,000 fr. annually for bounties to the merchant navy, wholly apart from the subventions to the mail lines. The bounty or premium is 60 francs per gauged ton, and 15 fr. per 100 kilogrammes, or double-hundredweight, of machinery. Britain accords no bounties for shipbuilding; now in 1895, while France constructed 35,825 tons of shipping, of which 14,000 were steam, that total was 100 per cent. less as compared with the output of Germany, and 3,000 per cent. inferior to that of England. Further, 93½ per cent. of the vessels constructed that year by England were steam, while 50 per cent. in the case of France were sailing craft. Another feature of the comparison may be indicated: since 1889 the English dockyards have been able to diminish, by a one-sixth, their number of hands, due to improved fitting up of plant, and to the use of more modern machinery, the output of work for all that was not diminished. That may explain somewhat why, in 1896, France constructed 35.825 tons of shipping, while the record for England was 1,139,534 tons during the same year.

The economic condition of France does not permit of her constructing ships cheaply. The raw materials employed are taxed. England has 50 shipbuilding yards, and France only 5; since 1893 but one new dockyard has been created in France, and its history has not been happy. British shipbuilders construct vessels with greater rapidity, and their cost is less than in a French yard. •The leading companies that construct the largest number of rapid vessels in England demand less time to turn out a steamer of 10,000 tons than the Forges et Chantiers Company of the Mediterranean—the first in France—takes to build a steamer of only 4,000 tons. The French yards have no competition, and have no division of work either. They never keep vessels in "stock," like the Armstrong firm for instance. The Loire yards build cruisers, torpedoes, sailing ships, and steamers of all dimensions. In England the work is methodised and correlated to a type-model of tonnage. This plan enables engineers, overseers, and men to acquire a technical experience and quickness in work under the best circumstances. Now, if the conditions of a French building firm be accepted, such involves higher prices and long delay. That would secure the bounty, but the latter would not cover the cheaper estimate—40 to 50 per cent.—and time saved to a broker for delivery as if the vessel had been commanded at a foreign yard. For example, in 1893, 58 of the steamers placed on the French register were built outside France, in 1895 that percentage rose to 75. Of 14 large steamers hailing from Marseilles in three years, two only, and the third a mail boat, had been constructed in France. The Bordes firm of brokers, of Dunkerque and Rouen, order their large sailing ships, the only ones that connect Chili and Peru in trade relations with France, in Great Britain, then they transfer them to Rouen to be registered under the French flag and baptized.

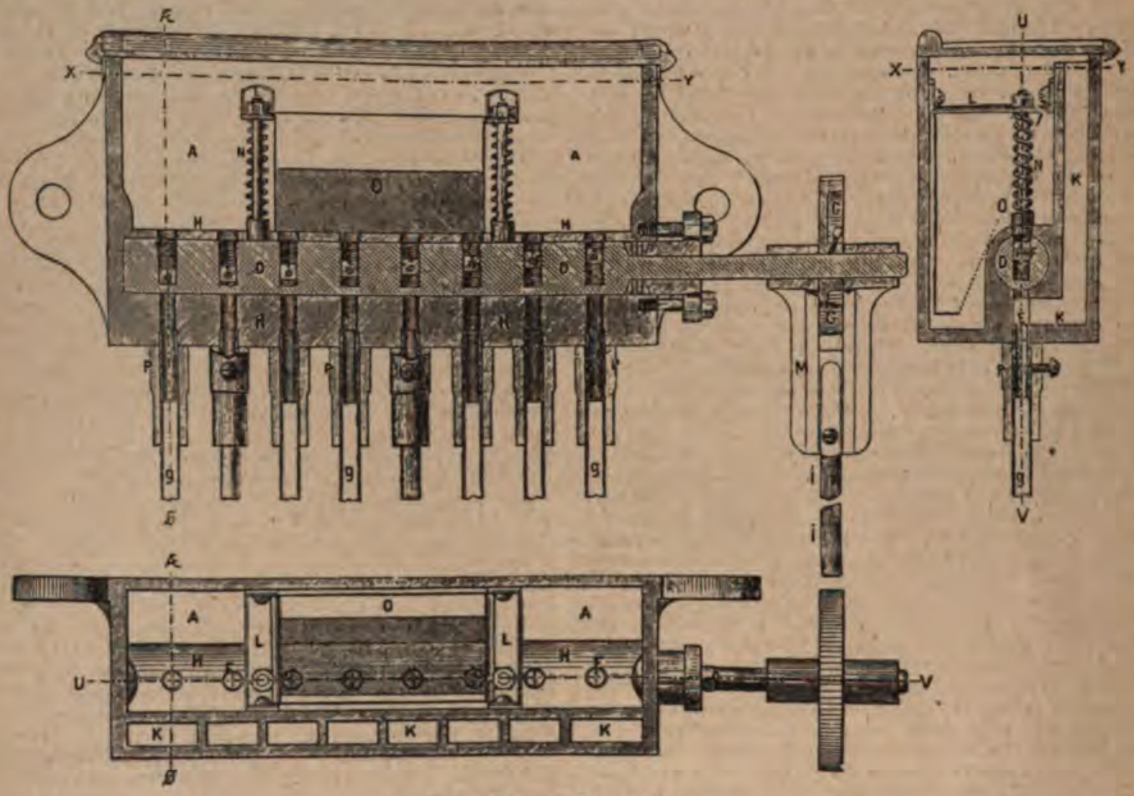
In the Far East, as in the Pacific, the French mercantile marine may be characterised by one word—penury. Yet France has made important sacrifices to uphold and spread her influence in the extreme East. Beyond her subsidized Messageries Maritimes packets she has no cargo boats, it may be said, dealing with Northern China, Japan, and Hong Kong. England and Germany represent some 25 companies engaged in the main routes, and some in the coasting trade. In Australia and North America French trading ships are rare. Between Central America and Peru none, the Bordes part-line excepted. Why have not other French brokers, the pluck and energy of their fellow citizens of the Bordes firm? Where 25 foreign companies can pick up cargo and make money, there would still be gleanings for France. It is not only in ships that Frenchmen are behind, but in their working of them also. They should have cheap freight; be certain to arrive and depart with punctuality; no chance sailings will suit merchants goods nowadays. And when a line can be depended upon, the differences of freight will be less reckoned as among the most important of considerations. In 1894, 2,517 vessels, representing a tonnage of 2,500,000 tons, entered the ports of Japan, and a collective in and out trade with Europe of 87 millions of dollars. The part of France in that global trade was 23 million dollars. While England had 1,000 ships, and Germany 300 to 400, in the Chinese Seas traffic, France had only 26—mostly composed of her bi-monthly mail boats. These ships really only take silks for Marseilles, and that can bear the expense of being railed to Paris and Lyons; they will accept, of course, cargo from Yokohama, to Havre, and London, but it must be re-shipped for these ports at Marseilles. Now England and Germany have their ocean lines which compete date for date with the French packets, but that embark cargo direct for Havre, London, Antwerp and Hamburg. The expense of transhipment is thus avoided, as are also the crushing dues, and devouring railway rates across France. The rice trade between Saigon, Tonkin, and Hong Kong, ought to be a monopoly in the hands of the French. Instead, it presents the aspect rather of a shame. Of 235 ships employed in that coasting transport, only 7 are French! Chinese. English, and German boats execute the carrying work; they have the suitable capacity, 800 to 1,500 tons tonnage; besides having mixed crews of Scandinavians and Chinese.

Respecting the Australian trade in such fresh food necessaries as mutton, beef, butter, poultry, eggs, rabbits, cheese, fruit, &c., by refrigerating apparatus, France has no ships fitted up to preserve these products. In the matter of wool, the situation is, however, more cheerful. Formerly France had to purchase all her Australian wool in London; now, she imports, and chiefly by her monthly mail boats, her yearly supplies—about 200,000 bales. But the Australian cities, such as Melbourne, Adelaide, and Sydney are rarely visited by any other French ships but mail boats. Of 3,000 vessels entering Sydney in 1896, but 36 were under the French flag, and if Sydney can claim a slighter total over her sister cities, that is due to the cross shipping transactions with New Caledonia. It has been recommended to France to try the experiment of "free ports," where cargo could be bonded free of duty, and re-exported following the prospects of markets. Hamburg, Bremen, and Lubeck afford such facilities to commerce; indeed, all British ports are free. Russia has one at Kola, on the White Sea, and others at Odessa, and its rival Novorassion. There is a free port at Copenhagen, and Stockholm will soon have one also. It would be well not to leave out of the inventory the rapid strides that the Japanese are making in the construction of vessels—they have 54 shipbuilding yards, and do not hesitate to make purchases still from England and Germany; they are establishing trade routes to various leading mercantile emporiums of the world. After the United States terminate their little war, they will, it is expected, throw themselves into the Far Eastern trade with renewed vigour. If French shipbuilders, brokers, and merchants do not strip for the running, compete for the prizes, they will be permanently stranded. They have England for a model, that relies on no bounties, and that demands no favours, and wins—though the fields be not always fair. Only the ancient Egyptians believed that strength resided in sitting still. Frenchmen must not collapse like the Chinese, but pluck up heart of grace, be bold, and so secure their place in the sunshine, like other important maritime and mercantile nations.

THE "OCTOPUS" LUBRICATOR.

THIS is a new Danish patent, being introduced by Mr. Harry Gray, of 110, Fenchurch Street. It is new in this country, but is very well known in Denmark. Some 17,000 of them have been supplied during the last eight years and are now in use, and it is claimed that from 25 to 50 per cent. of oil is saved as compared with the old-fashioned methods of lubrication.

The figure illustrates its construction. AA is the oil holder, GGG the oil pipes leading to the bearing surfaces. There is a shaft DD which is made to rotate by means of a rachet-wheel keyed on its end. This rachet-wheel is moved by an ordinary pall, and this pall is carried by a lever moved by a rod, which in turn gets its motion from the engine. The socket attached to the lever can be moved up or down the lever, and so the number of teeth taken by the pall at each stroke can be regulated and the amount of turn given to the shaft regulated also. Now the oil has to get through the shaft when it goes from A to G. A number of holes F are drilled in the shaft and screws fitted into the holes. These small screws can be turned until they remain at any position of the hole. The shaft is open to the oil-chamber at the top, and bearing against the socket in which it moves over all the rest of its surface. If much oil is wanted for a particular bearing the screw is put well down into the hole and all above it gets filled with oil each revolution of DD. If little oil is required the screw is placed very near the surface. The quicker the engine works, the more oil is passed to the bearings, and when the engine is standing the lubricator is inoperative. Each oil channel is supplied with an air ventilator KK. The oil is poured into a gauze sieve and gets strained before it flows into the pipes. Should anything go wrong with the working parts the channels KK can be converted into syphon lubricators.



The "Octopus" Lubricator.

"**Royal Navy List Diary and Naval Handbook**." We are informed that the second annual volume for 1899 of this book is now in the press, and will be issued in November next.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

The Isle of Man Service.

WHEN the last incursion was made into the preserves of the old established Isle of Man Steam Packet Company with a threatened opposition to be maintained with the discarded paddle steamers of the City of Dublin Company's Kingstown service, it will be remembered that the attack was warded off by payment. At the time I doubted the wisdom of the course pursued. Payment of ransom to one party encourages others to make similar attempts, and the steamers which then threatened them were of a character such as to render the attempt most unlikely to succeed. However, the directors took the course which seemed best to them, and already a new company is being formed to renew the attack. It has a portentously long name. It is to be called the "Isle of Man, Mersey, Clyde, Dublin, and Holyhead Steam Packet Company, Limited." Its programme seems to be ambitious in proportion to the length and comprehensiveness of its title. It is to start with a fleet of no less than ten steamships, each capable of carrying two thousand six hundred passengers. There are to be eleven arrivals at Douglas each day. Of these, three will be from Liverpool, and two each from Glasgow, North Lancashire ports, Holyhead, and Dublin. Thus nearly thirty thousand persons per diem can be poured into the little island. So after this line has been going a few weeks, they will have to hoist the signal, *standing room only*, on Douglas Pier head as they do at the pit doors of popular theatres. These considerations, however, are chiefly for the shareholders and directors. For it is sufficiently obvious that such facilities—even if we ignore the present excellent services—would be far in advance of any traffic that could possibly be induced, at least for many years to come. But from our point of view the most interesting thing about the project is the fact that these steamers are to have a speed of no less than twenty-eight knots. This is, of course, far in excess of any speed at present attempted by any commercial vessels, and it is such as must entail the most serious expenses for working. Seriously, I cannot think that anyone would venture on an undertaking on these lines. But we shall see.

The Atlantic Transport Company

has quite absorbed the five fine steamers it has just bought from the Wilson Furness Leyland Line. The names of all the vessels have been changed. Thus the

Victoria has become the *Mantou*,
Alexandra ,, ,, *Menominee*,
Cleopatra ,, ,, *Mohegan*,
Boadicea ,, ,, *Marquette*,
Winifreda ,, ,, *Mesaba*.

This new nomenclature is quite in accordance with the practice of the new owners, who name all their vessels after places in America, and always adopt such as have "M" for their initial letter. Nevertheless, one cannot help regretting the disuse of the famous and historical names which these vessels bore for so short a period at the very outset of their careers.

The Orient Line

will soon have its new twin-screw steamer *Omrah* delivered. She was launched at Fairfield on the 3rd September, as is fully described elsewhere. But it may be noticed that once more there was a difficulty in the operation of floating a big ship at Fairfield. It appears that though the vessel seemed to go off all right in the first instance, she came back on the ways and remained for nearly a tide. It is, however, reported that she was fortunate to escape any damage through her adventure.

The American Line

on the 3rd September received back from the United States Government the four big twin-screw vessels which have been so valuable as auxiliaries during the war. Thus a definite denial is given to all the rumours which so persistently asserted that one or other of them would be permanently retained by the Navy Department. They will doubtless before the end of the year be seen once more in the Southampton service. Meanwhile, the Red Star Liners are still carrying on the service. I was somewhat amused at reading the comments of the Southampton press on these vessels when the fact that they were to run the service was first announced. They expressed pleasure that "four good steamers" were to take the place of the *Chester* and the *Berlin*. The "good steamers" included the *Pennland* and the *Waesland*. Southampton people may be unaware that these two old craft are discarded Cunarders of a very ancient date. The *Pennland* was known as the *Algeria*, and was built in the very early seventies—ere ever the plans of the *Chester* or the *Berlin* were settled—by Messrs. J. & G. Thomson at Clydebank. When the Cunard Company became a public undertaking some ten years later she was sold out of the fleet as no longer suitable for their requirements, even in the Boston trade. The *Waesland* is an even older, if more famous, ship. She is none other than the once popular *Russia*, built in 1867. Of course, she has been enlarged and modernised. But even as she is, she is not quite a crack passenger steamer for the American Atlantic mail line.

The Nederland American Line

is evidently determined to make itself a strong position in the North-Atlantic passenger trade. Time was, and not so very long ago, when the smaller vessels of the White Star Line and of the British Shipowners' Company were thought good enough to supply its needs. Quite a new departure has, however, been made. The vessels of the two lines named had been built by Messrs. Harland & Wolff. The managers of the steamship line seem to have been impressed with the work of the Queen's Island yard. But they wanted to have some more recent examples of it than the old *Republic* and *Arabic*. So to Queen's Island they went, and from them had the *Rotterdam*, a twin-screw liner which may perhaps be best compared to the Dominion steamship *Canada*. She was so satisfactory that another and larger vessel of the same class followed. This was the *Statendam*, which has just completed her first round voyage. It is now announced that Messrs. Harland & Wolff have an order to build yet another ship of the same class for the Nederland Line. But at the same time we are told that a sister vessel to her is ordered from the well-known Hamburg shipyard of Messrs. Blohm & Voss. It may very well be that Queen's Island is so full of work that it could not guarantee delivery of a pair of steamers for a single owner within quite as short a time as the Nederland Company wished. But whatever the reason may be it is an unfortunate, and, I think, unprecedented, thing to see one Continental nation ordering vessels of this class from a yard which is not British if it makes up its mind to go to foreign sources at all.

The Stowage of "Dangerous Goods."

The disastrous loss of the Harrison Line steamship *Legislator* by explosion of chemicals in her cargo when on her outward voyage from Liverpool to the West Indies, will be fresh in the minds of readers of the MARINE ENGINEER. It may therefore be of interest to state that the Board of Trade has, in consequence of what transpired at the inquiry into that casualty, issued a new set of instructions to their surveyors as to the carriage of dangerous goods at sea. They give results of some very interesting experiments which they have had carried out as to the best mode of the conveyance of strong sulphuric acid. It seems that, though the general practice has been to carry this commodity on deck, it is really safer—if proper precautions be observed—to carry it below. The packages recommended are electrically-welded steel drums of a capacity of about half a ton each. These should be buried in coal to a depth of not less than three-fourths of the diameter of the drums, the quantity of coal present being sufficient to absorb any leakage that may occur from the package. Such leakage will, of course, affect the quality of any coal wetted by it. But its presence has the counter advantage of preventing spontaneous combustion of the coal which has been so wetted; whilst, in case of fire amongst the coal cargo from spontaneous combustion, the bursting of the drums will tend to extinguish the fire by liberating the acid. Still, the stowage of drums amongst coal known to be peculiarly liable to spontaneous combustion is to be discouraged. Reasons are given why the new mode of stowage is held preferable to the practice, hitherto observed in some ports, of stowing the acid on layers of chalk. The instructions, of course, are to a large extent a mere counsel of perfection, as there is no power in the surveyors to enforce the new suggestions of the Board on those who may have to store such goods. But the fact that the experiments have taken place, and that the recommendations have been made may induce some persons to follow the Board's advice. Public safety, too, will be promoted by the instructions now issued to the Board's surveyors that they are to take particular note when on their rounds of all vessels that may be shipping dangerous goods, and to see to the due separation of goods, which, whether "dangerous" or not in themselves, are likely to be so in combination with other goods that may be about to be carried in the same bottom. The Board has made lists of those dangerous goods that may be safely carried in close proximity to one another.

The Loss of "La Bourgogne."

One result of this deplorable catastrophe has been to call a good deal of attention to the question of lane-routes. The judgment of the Court of Enquiry at Halifax was so worded as almost to lead the unwary to imagine that the idea of these routes was then evolved by the Court itself from a consideration of the case. But every one who pays any heed to nautical matters knows that the question has long occupied the attention of those interested in the North Atlantic trade, and that for very many years lanes have been implicitly followed by the ships of some of the principal liners. Further they know that comparatively recently fixed routes for the ice and non-ice seasons were agreed upon by the British, German, and American liners, and that these are still adhered to. But the case of *La Bourgogne* has induced an anonymous writer in the *Times* to suggest certain possible improvements in the present agreement, and these suggestions have already been generally approved of by Mr. Ismay, of the White Star line, and by Herr Ballin, of the Hamburg-American Steam Packet Company. It would appear likely, therefore, that some modifications will be introduced into the present convention, and it is not improbable that instead of leaving the course of each particular trip to the discretion of the commander for the time being, the Compagnie Génerale Transatlantique will cause its vessels to follow the routes adopted by other vessels of their own class.

From a French newspaper I glean a very sad account of the circumstances under which many of the victims of the *Bourgogne* collision met their end. It appears that an American gentleman, Mr. Dillon, who lost his wife and daughter in the ship, organised an expedition to seek their bodies. The steamer which was chartered for the work of search was away a month. As far as the particular bodies which Mr. Dillon sought were concerned, the results were futile. But other bodies in large numbers were encountered. From them were taken any matters which could assist in their identification, and the sustaining life-belts were removed, thus permitting them to reach a final resting place in the ocean depths. It is, however, dreadful to learn that in the opinion of the medical men who accompanied the expedition many of these unfortunate persons had survived the disaster some four days, and had then at last succumbed to hunger and cold. It is said, too, that a raft was sighted with upon it no less than a dozen bodies. These persons likewise had been the victims of hunger. The provision of large quantities of life-belts would seem to be in some cases a very mixed blessing. For unless more permanent help is near, they seem only to substitute a prolonged and dreadful agony, both mental and physical, for the short and (as is generally believed) comparatively painless death by drowning.

Messrs. Elder, Dempster & Co.

with their usual enterprise, offered a prompt solution of the Fast Canadian Mail difficulty by their action in suggesting to the Government that these mails should be transmitted hereafter by the fine "M" boats of their line, plying between Bristol and Montreal. They shewed public spirit in offering to undertake the service gratuitously. But their offer was nevertheless one that no Government could have accepted. For, in the first place, there could not be the necessary control over contractors who were not paid for their services, and, in the second place, the ships offered, though excellent cargo vessels, are not of mail type. Twenty knots was the requirement of the Petersen-Tate contract, and the *Monarch* and her sisters are but of fourteen knots sea-speed. Acceptance of this offer would have introduced new and disturbing precedents into postal affairs and would have changed the policy of the Post Office entirely. Instead of their motto being "Speed at any reasonable cost," it would have now become "Economy first, speed nowhere."

The month of September has been an unlucky one for this firm's huge fleet. The *Landana*, a big cargo boat built but eighteen months ago by Sir Raylton Dixon, of Middlesbrough, was sunk in a fog off Ushant by collision with the steamship *Knarwater* of Newcastle, fortunately without loss of life. The *Times* sagely remarked that "the *Knarwater*, which is fitted with watertight bulkheads, is leaking slightly about the bows." The casual reader would be led to imagine from these words that, at least in the opinion of the so-called leading London daily, the *Knarwater* is exceptional in being so provided. I wonder if he, or any one for him can give the name of a sea-going iron or steel steamer on the British register which is not fitted with professedly watertight bulkheads.

The same company's steamship *Milwaukee*, the first of their eight thousand tons cargo vessels, stranded at four o'clock in the morning on the 16th September on an inhospitable part of the Scotch coast near Peterhead, when on her voyage from Shields to Montreal. This vessel was only constructed last year by Messrs. C. S. Swan & Hunter, of Newcastle, and already she has had one unpleasant experience, having broken her shaft on her maiden trip to New Orleans, and so being obliged to take very expensive assistance. This time she sustained very serious damage, her bottom forward being practically out, and but the faintest hopes of floating her are entertained.

But with so large a fleet there are items on both sides of the account. The *Marino*, a vessel at that time under Messrs. Elder, Dempster & Co.'s management, has rendered a valuable service to the Cunard steamship *Aurania*. The *Aurania* is the reserve ship of the Cunard New York fleet. During the summer, in conjunction with the *Servia*, she maintains a fortnightly extra service between Liverpool and New York, making Tuesday the sailing day. She was homeward bound from New York when at 9.30 p.m., on the 13th September, the forward web of her after-crank broke and damaged the bed plate. The injuries were impossible to repair. This was in lat. 50·13 N., long. 13·13 W. Some twenty hours later, when the *Aurania* had drifted slightly to the north and east, up came the *Marino* and took her in tow. At 2 a.m. on the 16th the two vessels reached Queenstown harbour safely, the distance over which the towage extended having been something like 285 miles. This occupied some thirty-two hours. The risks incident to such a performance were, however, not over. For whilst the vessels were preparing to anchor a coasting steamer ran between them, breaking the hawser and causing it to foul the *Marino's* screw, thus for the time completely disabling her. It would be improper for me to comment on the matter further at present, as the matter will doubtless occupy the attention of the courts.

It may be noticed in connection with this unfortunate accident to the *Aurania*, that she was appointed to make a sailing to New York again on the 20th. This of course she could not do. But the sailing was not to be missed. One shipping paper announced that the *Tyria* would take it. The *Tyria* may be an excellent ship for the fruit trade, but she is not an Atlantic Liner, and the suggestion was clearly an impossible one. In point of fact the *Scythia* took it and thereby seemed to falsify the statement that she was sold to the United States Government. But why could not the *Bothnia* step into the breach? If the *Bothnia* cannot be relied on in an emergency of this kind the sooner she is sold—even at old iron price—the better for all concerned. The money she would fetch, however small it might be, would then get a chance of earning a dividend, and at all events dock charges, up-keep, and shipkeepers' wages would be saved. It is this excessive love of antiquity which handicaps the line, and it has characterised it for years in spite of changes in the nominal management.

The Union Line

is making quite a new departure. It has for some considerable time maintained a service between United States ports and South Africa. But it has hitherto relied on chartered tonnage for this branch of its operations. I mentioned this fact some little time ago, when noticing the voyage of the West India and Pacific liner *European* under the Union flag. Now the line is apparently satisfied that it has built up a permanent trade in this direction, and is acquiring tonnage for the purpose of working it on its own bottom. Accordingly it has bought several ships. Amongst them may be noticed the *Mount Sephar*, late of Glasgow, a steel screw steamer of 3,702 tons gross register, built in 1896, by Messrs. Barclay Curle & Co., who fitted her with a single set of triple-expansion engines. Another single screw boat is the *Marino*, which has just finished her career in Messrs. Elder, Dempster & Co.'s service (she being owned by the Ocean Transport Company, whose managers they are), with the salvage of the Cunard s.s. *Aurania*, as elsewhere noticed. The *Marino* is about 115 tons bigger than the *Mount Sephar*. She was built by Messrs. Harland & Wolff, of Belfast, and engined by Messrs. Muir & Houston, of Glasgow. Then the Union Company have also acquired from Messrs. Elder, Dempster & Co. the *Montezuma*—a fine vessel with a rather chequered history, although she is a modern ship enough, having been built as recently as 1891. She, too, was built by Messrs. Harland & Wolff. Her original name was *Ionia*. She was ordered for the ill-fated City of Liverpool Steam Navigation Company. At one time she ran for the Atlantic Transport Company's London-New York service. She is a twin-screw vessel of 5,504 tons gross and her engines were constructed by her builders.

A Sale.

Several changes in the constitution of the fleets of the Mail Lines are reported. The most important is the sale of the Pacific Steam Navigation Company's reserve ship, the *Galicia*. She is a vessel of some thirty-eight hundred tons gross register, built just a quarter of a century ago by Messrs. Napiers, at Glasgow. She still has her original compound engines. But modern conveniences, such as electric lighting and refrigerating machinery, have been introduced. This vessel was once employed on the Orient Service, and is quite of the class and style of the vessels with which that company was supplied for its early efforts by the P.S.N. Co. Though the original owners have found a purchaser for her, she has only been bought with a view to a re-sale, and this was quickly effected through Messrs. C. W. Killock & Co., of Liverpool.

Salvage.

The art of ship-raising seems to be a very progressive one. The Americans have succeeded in raising the remains, including the engines and boilers, of a vessel lost forty odd years ago at the head of St. Mary's Falls Canal, on Lake Superior. Then, too, in the harbour of Trieste there has recently been raised what remains of a wreck which dates from the year 1812. The case of Messrs. Elder, Dempster & Co.'s steamer, *Dahomey*, stranded at Holyhead and salved thence, was early in the present year thought to be a record feat in this direction. But already the work of the *Dahomey's* salvors pales before that of the patient wreckers who have at last got off the 8,000-ton *China* after her five months and twenty-two days' sojourn on the Azalea Reef. The *Dahomey*, of course, was capable of restoration to her original service. It yet remains to be seen if the *China* is capable of repair. But that she was got off is in itself a very fine performance.

It is wonderful, however, what is not only possible but apparently profitable in this direction. For instance, I could cite the case of the tank steamer *Allegheny*, sunk now several years ago, in the river Delaware, by collision with the Belgium steamer *Caucase*. Her wreck was subsequently run into by the Allan Line steamship *Siberian*, as it lay at the bottom of the river, and whilst it then sustained a good deal of further damage some very interesting questions of law arose. Some of these are still under consideration. But after long-continued efforts the wreck was righted, lifted, and taken to Messrs. Cramp's yard. There it has been fully repaired, and the rejuvenated vessel placed upon the United States Register.

When all this can be done by the appliances with which we have become by use so familiar, it becomes interesting to consider the possibilities that lie before us if the latest American invention, the *Argonaut*, realises half the promises she makes. The *Argonaut* is a little submarine boat built for peaceful purposes, namely, to explore the ocean depths, and make valuable salvage. She will run along the bottom of the sea where necessary, and to her, of course, many well-known wrecks will be open that have long defied the attempts of the best divers owing to the depth in which they lie. The subject is a fascinating one, and the wealth which lies before the successful practitioner almost unlimited. But so many people have tried and failed that, though we may believe that some day the problem of submarine navigation may well be solved, we can hardly think that any one of so many enthusiasts is himself and at once to achieve success.

Liverpool Docks.

The George's Dock, the oldest of the existing docks of the Mersey Board, is now doomed to speedy extinction. An Act of the last session of Parliament gave the Corporation of Liverpool power to acquire it. This power, it is now settled, shall be executed, and that forthwith. The Dock will be filled in. A small portion of the space that it occupied, however, will be retained by the Dock Board for purposes of their own improvements. But the greater part of it will be used for the purpose of extending to the westward certain important Liverpool business streets and of making a frontage worthy of the city towards its river approach.

The "Britannic" Mail Robbery Case

has reached the final scene at the Old Bailey. Under very wise advice, Mr. Jago, the late first officer, and Mr. Kynaston, the late third officer of the mail steamer, pleaded guilty to the offences with which they were charged. Jago also pleaded guilty to a previous conviction for forgery in 1883. He was obviously the ringleader in the present crime, and he received a by no means too severe sentence of eight years' penal servitude. Kynaston, who was his dupe and tool, is punished by twelve months' hard labour and the loss of his position and character. Jago to the end proved himself the daring and ready criminal he was. For he actually tried after his committal for trial to induce Kynaston by money promises to withdraw the confession he had made.

Two observations have been made on the case. The first to the effect that no one officer should have full means of access to the mail room. That would be all very well if ships were as they are not. But since ships are as they are, the case of collision or other accident has to be considered and means have to be provided for getting at the mails without undue waste of time in case of emergency, in order that they may be quickly saved from a sinking ship.

This consideration, however, makes the second of still greater importance. For it is obvious that too much care cannot be taken in the selection of the men to whom these great responsibilities are entrusted. We may perhaps hear some day how it was that the White Star Line—of all British steam companies—took a man who had just come out of gaol into its service as an officer. But if the natural comment is that "there must have been carelessness somewhere," we must remember that not only was the steamship company deceived, but the Board of Trade also was caught napping. A conviction such as that which Jago has admitted he suffered in 1883, is a ground for cancelment of the Board's certificate. We know, too, that the Board is most determined, and perhaps, in some cases severe in its action in this matter. We have known instances where men have been convicted of much less infamous crimes than forgery, and have had to suffer the loss of their certificates in consequence. It is certain therefore that somehow or other the Board of Trade was kept in ignorance of this episode in Jago's career. That being so, Messrs. Ismay, Imrie & Co. might well be blinded by the same tactics, and they would further be put off their guard in this respect by the knowledge of the Board's practice in regard to officers who have suffered conviction. Be this as it may, the case is a strong warning to officers to avoid temptation and to employers to take every care in the selection of their officers and to elaborate as far as possible the usual precautions now taken for safeguarding the over-sea mails whilst in their custody.

Publications.

The Channel Fleet, which has not been seen in the Mersey since the year 1890, was appointed to arrive in the Port of Liverpool on the 23rd September. This does not allow me in the present issue to make any mention of the details of the festivities attending the visit, nor of the various forms of hospitality by which this centre of shipping will endeavour to shew its appreciation of the services of the gallant sailors who insure the safe progress of our merchant fleets. But from the office of the *Liverpool Daily Post* I have received a little guide which has been prepared in anticipation of the event. It contains the names of the Committee appointed to extend the City's welcome, and a very distinguished array they are. Then there is a programme of the public functions and an account of the arrangements that have been made to enable the good people of Liverpool to inspect the warships. Each of the vessels composing the squadron is carefully and simply described, and some general information regarding our maritime defences appended. What brings the booklet into the scope of this column is the fact that it includes also an account of the auxiliary armed cruisers *Majestic* and *Teutonic*, which are fairly well-known in the port. Their presence is appropriate enough, since they were the first merchant ships specially designed to meet Admiralty requirements and because they serve as an excellent standard for emphasising the differences in design between mail steamers and warships. Especially interesting in this character are they now when the behaviour of the American liners in the late war has shewn the value of these auxiliaries and silenced adverse criticism for ever. With the printed matter excellent illustrations of all the vessels are afforded, and it will be noticed that very good cuts of the White Star buildings, both in Liverpool and in New York, also appear. The Liverpool office I have described on a former occasion. Suffice it here to say that the New York business house is as lofty as its Liverpool counterpart is beautiful.

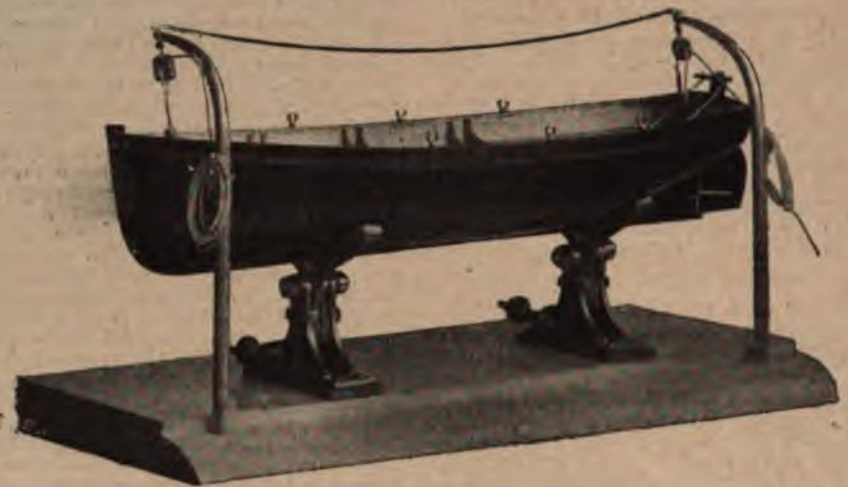
Liquid Fuel.

Most marine engineers are probably aware that the Admiralty is now conducting certain experiments with regard to the use of liquid fuel for steam-raising purposes at sea aboard H.M.S. *Surly*. Alderman Sir Marcus Samuel, who is one of the most enterprising shipowners in the City of London, is, of course, deeply bound up in the question from a commercial point of view. He has, therefore, been sufficiently interested in the subject to try a bold experiment, and that on a very large scale. The two most recent additions to his fleet have been adapted for the consumption of liquid fuel, and the past month has seen some very interesting trials with one of these vessels, the *Haliotis*. Various points appear in favour of liquid fuel. The stokehold is kept cool for one thing. Then firemen are practically dispensed with. During the trial of this ship, the only occupant of the boiler-house was a Chinaman. The absence of firemen might tend to relieve the anxieties of many a chief engineer. But the important point to the shipowner is the economic one, and it is that which will determine the extent to which the innovation can go. It is said that there is an economy in the weight of fuel carried of something like forty per cent. This, of course, means that the freight-paying weight carried can be considerably increased. Then again, the fuel being liquid, it can be stowed where coal cannot be carried, and thus double bottoms and ballast tanks can be utilised. Probably the question of safety will not be raised again, as the experience of so many tankers has shown that, with care, it is not a very dangerous cargo. But still there are two serious questions to be considered. How can Britain, which has no oil wells, insure a supply in time of possible hostilities, and how in time of peace are we to be sure that a greatly increased demand, such as universal adoption for marine purposes would entail, will not raise the price to a prohibitive figure? It is on these points that we now need enlightenment.

Bristol Docks.

Whatever may be the reason the Bristol Docks scheme is again shelved. It may be that a fit of economy has come over the good people of the "Metropolis of the West" after their lavish hospitality to the members of the British Association. It may be that they resent being told what to do by a practical man like Mr. A. L. Jones, of Messrs. Elder, Dempster & Co., who is doubtless thoroughly sick of their vacillation, and was kind enough to try and help them make up their minds for once. Be this as it may, there was not a sufficient majority in favour of the proposed scheme to entitle its promoters to go to Parliament with it, and, accordingly, at least another year is wasted. Bristol will begin her work when her trade is gone, and it is too late to do anything.

COLLAPSIBLE "BOAT CHOCKS."



Collapsible "Boat Chocks." Fig. 1.

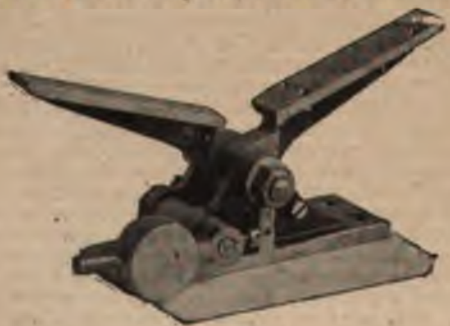


Fig. 2.

IN former times the lifeboats on board ship were secured by fixed hinges so that the boats had to be lifted in order that the chocks might clear the bottom of the boat when they were turned over on their hinges. Later the Board of Trade issued regulations requiring that the chocks on which the boat rests should be constructed so that the boats can be at once swung outboard without the boats requiring to be lifted by the tackles. To overcome this defect and conform with the Board of Trade's requirements, the outer chocks are now made to slide on their beds, a recess being cut in the chocks, and a corresponding one in the beds, into which a wooden key is fitted which can be knocked out to enable the chocks to be slid back, or the hinge is attached to a long bolt on the side of the bed, and on which it can be moved back clear of the boat and can then be turned over. When the keel of the boat is left touching the bed it will be necessary to lift the boat by the tackling before it is clear and can be swung out.

A lifeboat with its full complement of gear and stores is of considerable weight, being as much as 3 to 4 tons, and will require the united strength of several men pulling on the ropes of the tackle at both ends, and if the ropes are swollen with the wet, or rendered hard or stiff by cold the operation of lifting the boat is rendered much more difficult, and more time will be lost in getting it out.

The illustrations show the collapsible boat chock (Hamlyn's patent, being introduced by Mr. Harry Gray, of 110, Fenchurch Street, London, E.C.). It will be seen that the boat is supported on the chocks and the keel also supported with wedges. The chocks are shown as up, supporting the boat, in Fig. 2, and in Fig. 3 they are shown lowered, and everything is free for the boat to swing out, and there is ample clearance left under the boat. The chocks are made of cast steel or gun metal, and they are of shape like a bent lever. On the sides of one lever the boat is supported. At the end of the other lever is a recess. When the chocks are up, supporting the boat, both recesses are vertically below the hinge which

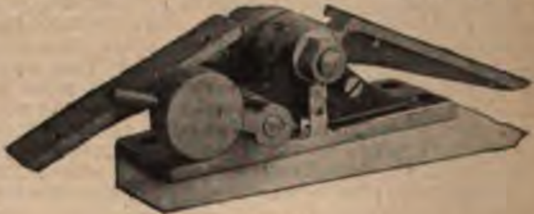


Fig. 3.

supports them. At the bottom there is a lever with a turned-up end which can fit into the recess in the chocks, when the chocks are up. This lower lever is kept in the recess by a balance weight at its end. When the chocks are to be released the lever is lifted, the chocks are freed, and they fall. When in place the keel is supported by a wedge, and when the chocks are lowered, the arrangement of their hinges is such that the wedge cannot remain in place, but slides to one side, and the boat is quite clear to be moved out at the side.

These "boat-chocks" have been fitted on s.s. *Marjorie*, of London, on the *Trinity Yacht*, and on the *Conservator*, which has just been on a trial for the Thames Conservancy. This yacht, which has been built by R. and H. Green, of Blackwall, is fitted with two boats, carried on boat beams abreast of the deck-house, which forms the engine-room skylight. The type "C" chocks are used which allow a clearance of about 9 in. between the keel of the boat and the deck or beam.

At the inspection on board, the lever was lifted and the tooth which retained the lower arms of the chocks being lowered released the chocks, and the boat was left hanging on the davits. It was also shown that the chocks could be adapted to meet all requirements.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The "Powerful" and her Detractors.

THE *Powerful* is slowly but surely redeeming the bad character which was given to her by the "naval experts" at the beginning of her career. The news comes from Yokohama of a most satisfactory series of trials having been carried out. She was ordered to run at 5,000, 8 500, 12,000, and 18,000 H.P., and in the latter run the coal consumption was 1·98 lbs. per I.H.P. per hour, including the coal used for all purposes. The run was from Wei-Hei-Wei to Yokohama, and the 1,200 miles between these places was covered at an average of 18 miles an hour. The first 24 hours was run at an average of just over 19½ knots, but there were times when the speed was fully 22 knots. Everything worked smoothly. All this goes to prove that the *Powerful* is living down her bad reputation, and that it is merely necessary that the engine-room staff of a ship should become thoroughly acquainted with her to get the best results. There is little doubt that the *Terrible* will prove herself an equally good ship despite all that is said to the contrary by Mr. Allan and his supporters, and their objections to the water-tube boilers with which both these vessels are fitted.

Water-Tube Boilers and their Critics.

It would seem that the discussions as to the merits and demerits of water-tube boilers are to be endless. Mr. Allan and his friends recently commenced an agitation against this type of boiler, but the result of their efforts cannot be very satisfactory to them. Mr. G. N. Dunell's letter to the *Times*, in which he champions the Belleville boiler, elicited a somewhat weak reply from Sir A. B. Forwood, and the member for Gateshead also expressed his wish to know why the *Terrible* should undergo another series of trials, to prove what was already demonstrated two years ago by the Admiralty, when they reported that the trials on that occasion were highly satisfactory. The 25,000 H.P. trial, however, which the *Terrible* ran in the early part of 1897 was of a very different nature to the 15,000 H.P. trial which was just as successfully carried out. The *Terrible* had a 60-hours run at 15,554 H.P. with an average of 1·96 lbs. of coal per H.P. The results, too, of the *Diadem* trials were by no means favourable to the contentions of Mr. Allan and Sir A. Forwood, for she steamed for 60 hours at 16·8 knots, at a cost of 2·01 lbs. of coal per hour. But this is not an event upon which we ought to congratulate ourselves overmuch for the fact remains that the French have done as well. The *Charlemagne*, for instance, did 16·15 knots for 1·47 lbs., and 17·2 knots for 1·6 lbs., the *Gaulois* 14·3 knots, for 1·34 lbs. and the *Massena* 15·5 knots for 1·65 lbs. We may presume that these figures include the coal used for all purposes. This all goes to prove that "the water-tube boiler is the boiler of the future," which is the opinion of Commodore Melville, of the United States' Navy, and many other equally distinguished foreign engineers and constructors.

Reorganiz'ng the French Navy.

The scheme for the reorganization of the various squadrons composing the French Navy has now received Government sanction. The changes, in all probability, will take place this month. It is stated that the four ships of the *Valmy* class have been detached from the Channel squadron on account of their rolling so much in rough weather, they being better suited for smoother water. They are to go to Toulon, and are to be fitted with bilge keels. The modern vessels, *Marceau*, *Neptune*, and *Magenta*, too, are to replace the old gunnery and training ships, *Couronne*, *Algeciras*, and *Caledonien*. In future the Channel squadron will consist of the *Formidable* (flag), *Amiral Duperre*, *Amiral Baudin*, with the *Devastation*, *Redoubtable*, and *Courbet* as the second division. The cruisers will consist of the *Dupuy de Lome*, *Catinat*, and *Surcouf*, with the destroyers, *Epervier* and *Cassini*. Three sea-going boats will also be attached to the squadron. The Minister of Marine asserts that by next spring all the wooden ships serving at present on foreign service will be relieved by modern steel vessels. The largest battleship yet built in France was launched at Brest at the commencement of last month. This is the *Jena*, which displaces 12,052 tons, is 400 ft. 9 in. long, with a beam of 68 ft., and a draught of 27 ft 6 in. She is to be protected by a complete belt of steel 13·7 in. thick amidships, and thinner towards the extremities, resting upon an oak backing 6 in. thick. Her armament will consist of four 12 in. guns, eight 6·4 in. quick-firers, and eight 3·9 in. She will also be fitted with Belleville boilers with mixed coal and oil stoking, and three engines to develop 15,500 H.P., and a speed of 18 knots.

Portsmouth Dockyard.

Nothing of exceptional interest has happened at this yard during the past few weeks. The accident to the *Formidable* was unfortunate, and necessitated a new bracket shafting being made. It cannot be definitely stated how long this will take, but it is hoped that the ship will be launched before the new year. The *London* is to be practically another *Formidable*, and the drawings which were used for the latter are to be used in the construction of the former. The second-class cruiser *Latona* narrowly escaped serious injury a short time ago. It seems that a fire broke out in her engine-room, but was discovered in time by one of the artificers, who promptly called for assistance, and the fire was ultimately extinguished. It was found to be in the centre of the ship, and if it had been allowed to get more of a hold than it did, it would have caused the explosion of a tank of oil, when the consequences would have been serious. The torpedo boat destroyer *Fawn* has been delivered here from Messrs. Palmer's, also the *Teaser*, one of the 27-knot torpedo destroyers built by Mr. J. S. White, of Cowes. The cruiser *Europa*, under completion here was ordered to be out of dockyard hands at the end of the past month. The refit to the *Barham* has just been completed here at a cost of about £28,000. She has had a new set of water-tube boilers (Thornycroft) fitted into her in place of the locomotive boilers which she formerly carried, her armament has been modernized, and her propelling machinery has undergone a thorough overhauling. She had already done two commissions in the Mediterranean, and it is believed that she is to go out there once more to take the place of the third-class cruiser *Scout*.

A Plucky Engineer.

Some interesting details have come to hand from Malta concerning the recent accident which occurred to the torpedo-boat destroyer *Foam*, while carrying out her commissioning trial. It appears that the ship was going 27 knots on the measured mile, when an explosion occurred in the engine-room, owing to the bursting of the great intermediate cylinder. At the time of the accident the pressure of steam was about 200 lbs. to the square inch. The engineer in charge, Mr. R. W. Toman, R.N., lost no time in endeavouring to turn off the main throttle-valve. The result was that he was badly scalded about the arms and face, but despite this, he ordered the engine room to be cleared, and with engine-room artificer Ireland went into the stokehold and turned off the main stop valves. Then we are told he lifted the safety valves on deck, thereby relieving the pressure on the boilers. Thinking there might be someone left in the engine-room, he returned and searched, but, when endeavouring to get up the ladder, was so overcome by the volumes of escaping steam that he twice fell back, and it was only at the third attempt that he reached the deck, with his hands practically denuded of skin. Mr. Toman's action is deserving of the greatest credit, and it is not too much to hope that he will be presented with the Albert medal, as his prompt action probably saved the *Foam* and the lives of all on board. The assistance which artificer Ireland rendered, too, deserves some special recognition. According to the latest accounts Mr. Toman was progressing favourably.

A New Coaling Record.

The *Majestic* has once again made a new coaling record, this time breaking her own record. On September 13th at Portland Roads the battleships of the Channel Squadron commenced coaling. The flagship had to take in 1,268 tons. The *Majestic* took in 850 tons from colliers at the rate of 182·2 an hour, the crew working continuously, except for a quarter of an hour's "stand easy." We are not told whether the record of the maximum amount for one hour was beaten, but this previously stood at 190 tons, to the credit of the *Majestic*, the *Magnificent* coming next with 141 tons in one hour, and the *Mars* third with 140. In January last the *Mars* took in 180 tons in one hour at Portsmouth, and in the previous December the *Magnificent* took in 164 tons in one hour at Vigo. It is usually claimed by those vessels who fail to take in their coal as quickly as the ship which makes or breaks the record, that the colliers are sent to them half empty; and if this is so, it is certainly unfair; for whichever ship has the best of the colliers, whether it be the flagship or any other, will certainly take in the greatest amount of coal in the shortest time.

The End of the "Crescent's" Commission.

A few weeks ago his Royal Highness the Duke of York paid off the crew of the *Crescent*, and the vessel herself was placed in the A division of the Portsmouth Fleet Reserve. Although the commission has been such a short one, it has been exceedingly pleasant for all concerned, and the leave-taking was very hearty. When the Duke mustered the crew for the last time he read to them a flattering report upon the ship by Admiral Sir Michael Culme Seymour, the Commander-in-Chief at Portsmouth, and wished them a hearty farewell and a pleasant time during their next commission. The leave taking of the officers was most cordial. Prior to paying off, the crew presented to the Duchess of York a big, handsome leather-cased album bearing the name of the ship, surmounted by a crescent and crown in gold on the cover, and containing all the photos taken by chief petty officer MacGregor, chief torpedo instructor, who is an excellent photographer. Her Royal Highness graciously accepted the souvenir, and in return presented each petty officer and warrant officer with a signed portrait of the Duke. The Duke also presented midshipman Gibbs, who had acted as his aide-de-camp during the commission, with a gold pin as a memento of the cruise. It cannot be claimed that the commission has been productive of any great results, for the *Crescent* has not steamed more than 2,000 miles, and was refitted at a cost which would have been sufficient for a three years' commission. It was the first captain's command the Duke had held, and it will probably be the last, for it is on the cards that his Royal Highness will shortly become a Rear-Admiral.

Devonport Dockyard.

The chief work at this yard at present consists in completing ships for the pennant, although the *Implacable* and *Ocean* absorb a great deal of attention. Some difficulty was experienced in obtaining a sufficiency of Welsh coal to proceed with the preliminary tests of the boilers of the *Ocean*. In order to overcom this, the machinery contractors proposed that the boilers should be placed on board, and the tests proceeded with some other time. The whole of the armour-plates of the *Ocean* have now been delivered by Messrs. Cammell. The cost of this armour will be £156,820. The armour for the *Implacable* is only to cost £140,000, although she is a larger ship. For weeks past more than 1,000 men have been at work on the *Implacable*, and overtime is being freely resorted to to hurry her forward. She has already had some 2,000 tons of material built into her, her stem and stern posts have both been fitted, and it is determined to make a new record in ship construction if possible. Among the vessels undergoing refit here is the *Philomel*, and the necessary work on her is taking much longer than it was at first thought it would. She is to relieve the *Phœbe*, when ready, on the West Coast of Africa. The *Philomel* has already exceeded her allotted time out there, and it is an unfortunate fact that nearly three-fourths of the original crew which went out to her in 1895 have either been sent home owing to sickness, or have died. The extension of time which has been given for the refit of this vessel lasts until the 20th ult. It was originally intended that she should be completed by July, but further defects were discovered which needed attention. Some £15,000 has already been spent upon her. The first-class battleship *Glory* is to come to this yard to be completed for sea. The completion of the *Sirius* has been delayed somewhat on account of a defect which was discovered in one of her boilers. The repairing of this has now been taken in hand. Now that the coal strike is over, it has been decided that Welsh coal only will be supplied to vessels to be commissioned, and the Admiralty have ordered 10,000 tons to be delivered at this yard immediately. Captain C. Johnstone this month relinquishes his command of the Royal Naval Barracks. Captain Johnstone was a strict disciplinarian, and on this account some hostile feeling was shown against him soon after he was appointed.

A Successful Shipwright Apprentice.

Considerable interest is attached to the career of Mr. Charles E. Goodyear, who commences this month a course of study in practical shipbuilding at the Royal Naval College. He commenced his career at Devonport dockyard, 1893, as a shipwright apprentice. In almost every branch of his work to which he has devoted his attention he has been successful, and has carried off a unique list of prizes. He was recently awarded the first position on the Whitworth Scholarship list, which gives him £125 a year, tenable for three years. This is the most hotly contested scholarship in Great Britain. In the course of the last five years Mr. Goodyear has attained the following successes: Special prize of £5, awarded by the Worshipful Company of Shipwrights, for obtaining the first position on the Honours Naval Architecture list of Science and Art Department; first position on the Whitworth Exhibition list, with £50 for one year; first on the National Scholarship list, with three years free training at the Royal College of Science, South Kensington, and £60 a year; a Royal Scholarship of £15, tenable for one year; first class Associateship in the Physics Division; first-class Associateship in the Mechanics Division; an Admiralty Scholarship of £50 a year, tenable for three years; and a free studentship at the Royal Naval College, Greenwich, as a private student in naval architecture. Mr. Goodyear has won a succession of higher awards, such as no other dockyard apprentice has ever attained, and if he continues his career as he has commenced it, we may in time to come see him holding the post at present so ably filled by Sir William White.

A Record Run.

The record run of the U.S. battleship *Oregon* from Bremerton in the Pacific to Key West is still the subject of much newspapr talk in America. A letter written by First-Assistant Engineer C. N. Offley gives some details of the run, which will be read with interest by all engineers. The vessel, it appears, had just left the dockyard hands at Bremerton, where both engines and boilers had been put in thorough working order. During the run every endeavour was made to avoid using salt water in the boilers, and every leak in them, no matter how small, was stopped at once. The vibrators and distillers of the *Oregon* have a capacity of 5,000 gallons a day. While the voyage lasted, every protection was taken to guard against treachery, the sentries were doubled, more cartridges served out, quick-firing guns kept ready, and steam launches patrolled round the ship all night. The tables given below are taken from a recent number of the *Army and Navy Gazette*. and only include the time when the ship was under way, the time while leaving and entering port being eliminated. The coal does not include that used while lying in port.

⟼	Distance in Knots.	Time in Hours.	Speed in Knots.	Expenditure of Coal in Tons.	Knots Run per Ton of Coal.
Bremerton to San Francisco	827·7	72	11·49	221·0	3·74
San Francisco to Callao	4,076·5	371	10·99	962·0	4·24
Callao to Port Tamar..	2,529·9	212	11·93	785·0	3·22
Port Tamar to Sandy Point	132·0	9	14·55	66·0	2·00
Sandy Point to Rio de Janeiro	2,247·7	223	10·08	657·0	3·42
Rio to Bahia..........	700·0	*	*	288·0	—
Bahia to Barbados....	2,229·0	193	11·55	620·0	3·59
Barbados to Jupiter ..	1,683·9	142	11·86	478·5	3·3
Jupiter to Key West ..	280·0	27	10·37	77·9	3·6
Totals	14,706·7	—	—	4,155·4	—

* Speeds variable. Data unreliable.

Details of the New Russian Programme.

The details which have come to hand of the new Russian shipbuilding programme are not very definite, but they show us that none of the new ships have been ordered in this country, America, France, and Germany getting all the orders which have been placed out of Russia. At La Seyne one battleship has been ordered, and is described as being of 13,110 tons, 338 ft. 8 in. long, with 75 ft. 5 in. beam, and 26 ft. draught, to be armed with four 12-in. breech-loaders, and twelve 6-in., very many smaller quick-firers; engines of 16,500 H.P. and speed of 18 knots. An armoured cruiser is also to be built at this yard, and is to displace 7,800 tons. Her other dimensions are :—Length, 442 ft. 11 in.; beam, 57 ft.; draught, 21 ft. 11 in.; armament, two 8-in. and eight 6-in., twenty 2·9-in., and seven 1·8-in. quick-firers; engines 16,500 H.P.; speed, 21 knots. Two battleships are to be built at Messrs. Cramp's, of Philadelphia, of 12,000 tons displacement, and a speed of 18 knots. They are to be sheathed, coppered, and to carry four 12-in. and ten 6-in. guns. In addition, Messrs. Cramp will lay down three protected cruisers of 6,000 or 6,500 tons, with a speed of 23 knots. Messrs. Schichau, of Elbing, are also to build a cruiser, and two others are to be laid down at the Nicolaieff yard. From another statement we learn that there are six cruisers altogether, their dimensions being as follows :—Length, about 400 ft.; beam, 53 ft.; draught, 20 ft.; armament, twelve 6-in., and eighteen smaller quick-firers; engines, 18,000 I.H.P.; speed, 23 knots; turtle-back armour deck, and cofferdams packed with cellulose. From the same source we learn that four armoured cruisers of 3,000 tons displacement are to be laid down, 385 ft. long; 40 ft. beam; 16 ft. draught; speed 25 knots; armament, six 4·7-in., and six smaller quick-firers. Three torpedo-boat destroyers are also to be built at La Seyne, three at the works of M. Normand, and four at Messrs. Schichau's, and there are four others also in hand at Nicolaieff. The review of the Black Sea Fleet by the Czar a couple of weeks ago appears to have been a brilliant affair, and included battleships, cruisers, training-ships, gunboats, and torpedo boats. The Czar expressed his conviction that the fleet under instruction would maintain the glorious traditions of its predecessors, the heroes of Sinope and Sebastopol.

Sheerness Dockyard.

A good deal of attention attaches to the trials of the *Pactolus* and the results are sure to be compared with those of the *Proserpine*, the engines of which vessel were fitted here, and made at Devonport Dockyard. The *Pactolus* is the first of the contract-built ships of the "P" class to be tested, so that it is extremely unfortunate that the results of her first 30-hours trial and her 8-hours trial were not so satisfactory as could be wished for. It seems that a tube burst at the 8 hours trial, but until this accident happened, there had been every prospect of a successful trial, the required H.P. being easily obtained, with a speed of 19¼ knots. She worked up to 3,631 H.P. at 30-hours coal consumption trial with a speed of 16·6 knots, but her coal consumption averaged 2·46 lbs. per I.H.P. The *Proserpine* is to be commissioned very shortly for the North American and West Indies Station and her berth in the steam basin goes to the *Perseus*, which vessel is now having her armament mounted. This armament is to consist of eight 4·5 in. quick-firers and eight 3-pounder quick-firers in addition to three Maxim guns. The *Avon*, torpedo-boat destroyer, has arrived here from Barrow-in-Furness. She is to steam at thirty knots, and she will be completed for commissioning at Chatham.

A Knotty Question for the Admiralty.

The question has again come to the fore as to the advisability of giving an engineer the power of awarding minor punishments to the men under his command. The reason that the Admiralty have in times past refused to grant this privilege is believed to be principally that it would not be well for the executive officers of the Navy to delegate this authority to others, but surely the case would be met if the engineer officers were given the power to award light punishments, and not to have to take their men before the executive officer for every small breach of the rules. Again, it is not conducive to discipline if the engineer officer on this account invents illegal punishments of his own, for if such a course were adopted, the engine-room staff would be more discontented than if they had received from their superior some small punishment which it should be in his power to inflict. Therefore, the demand is not unreasonable, and as it has not been proved that the delegation of authority to the engineer to punish his men is injurious to the interests of the service, the proposed innovation should certainly be given a trial. It has been asked whether the engineers will be satisfied with the power of awarding minor punishments, and whether the next demand will not be for executive command. In every class of society there is a discontented and ambitious few, and therefore it is extremely probable that this would be the case. It has been urged that there should be engineer lieutenants, in the same way as there are gunnery lieutenants and torpedo lieutenants; but then it must be remembered that naval engineering is a much more extensive branch of study than naval gunnery or torpedo work, and is a distinctly separate branch of the Navy. The increased improvement of machinery afloat has resulted in both a social and professional advance in the status of engineer officers, and the chief engineer of any warship is only second in importance to the captain himself.

Proposed Naval Barracks at Sheerness.

The reasons which induced the Board of Admiralty to abandon their proposal to build new naval barracks at Sheerness has now been made public. The barracks were to have been erected at a cost of £220,000, and were to accommodate thirty officers and one thousand men of the new Naval School of Gunnery. A letter from the Civil Lord of the Admiralty, written at the desire of the First Lord, has been sent to Mr. F. Gorell Barnes, M.P., and in it the Admiralty have set out their reasons for the abandonment of the scheme. Mr. Chamberlain says that the question has for some time caused the Admiralty much anxiety and has received careful consideration. The proposed site at Sheerness was never considered wholly satisfactory, but it was the only one available within reasonable distance of the gunnery establishment, and at the time it was selected it seemed impossible to conduct the work of the gunnery school elsewhere. This difficulty has since been overcome. The reports at present before the Admiralty concerning the Sheerness site were of such a nature that no Board could take the responsibility of building barracks for a large number of men in such a position. The greater portion of the site was below the level of high water, and on account of the nature of the soil, if the barracks were erected, it would be necessary to incur enormous expense in driving piles for the buildings to rest upon, while a thick layer of concrete would have to be put down over the whole area, costing at least £150,000 before the buildings were begun. The Board of Admiralty were advised that such a state would be unhealthy. The existing barracks will continue to be used to the full extent of their capacity, but for the necessary extension the Admiralty will have to look elsewhere. Mr. Chamberlain does not explain how the difficulty has been overcome. It will be remembered that on the occasion of the memorable flood in November last, the site of the proposed barracks was submerged to the depth of about three feet of water, and that the water remained on the ground for some days. If the medical officers are correct in their assumption that the site would prove unhealthy, the Admiralty have done wisely in rejecting it.

The Half-Yearly Gunnery Returns.

The half-yearly returns of prize firing for the heavy guns of the Navy are now on hand, and are not at all satisfactory. The returns from the China Station are better than those from any other. The result of the *Iphigenia's* firing shows 77 per cent. of hits, and of the *Grafton's* 59 per cent. The Channel Squadron, as must be known, does not wait for any particular date to carry out its prize firing, awarding the prizes allowed at ordinary target practice instead. A correspondent writing to a contemporary gives the reason for the China Squadron being at the head of the list. He asserts that it is the custom there to carry out prize firing, but instead of using the ordinary targets a rocky islet is picked out, and the gunners fire at that; but it is pointed out that a shell, exploding anywhere on the rock near the target, appears to an observer as a hit, and as it is not possible to check the target, therefore the return is not accurate. On the Mediterranean Station the *Nile* has apparently done best, for the return shows that she made 52 per cent. of hits with her turret guns, and 50 per cent. with her 4-in. quick-firers. At the Cape the *Phœbe* and *Barrosa* have made 65 and 62 per cent. of hits respectively. Judging by the returns of other Navies, it is not such bad reading, but it is not the shooting that Her Majesty's Navy ought to show. It may be mentioned here that the extraordinary statement has been made that no musketry firing has been practised by the seamen of the Channel Fleet for the last two years, except at sea targets. Some enquiry should be made as to what amount of truth there is in this statement; for what is the use of issuing the latest weapon to the men of the Fleet if the men are not taught how to make practical use of it when the time comes?

Chatham Dockyard.

The ships completing at this yard, the *Irresistible* and the *Pioneer*, are both receiving a good deal of attention. As regards the *Irresistible*, a great many of her steel armour-plates are already in position, and about 3,500 tons of material have now been worked into the hull, and her launch in December next is confidently anticipated. The launch of the *Pioneer* has not been fixed for any special date. Some little delay has been caused through the engine contractors, but as the vessel is in a very advanced state of completion, the date of her launch cannot be very far distant. Her plating is complete fore and aft, and at a casual glance she looks as if she were actually complete. Of the vessels undergoing refit, the *Warspite* presents quite a busy appearance, and her repairs are to be completed without loss of time in order that she may go out to the Pacific Station to relieve the *Imperieuse.* It is expected, too, that the trials of the new machinery of the *Dreadnought* will take place, it is believed, in about six weeks' time, and before the present financial year is at an end she is to be ready for the pennant. Some minor defects of the *Dido* and *Isis* have been attended to, and when ready these vessels are to leave for the Mediterranean to relieve the *Astrea* and *Forte*, which vessels will pay off at Chatham, and there undergo a refit. There is a great scarcity of engine-room artificers at the Naval Depot here, in spite of the endeavours which have been made to obtain suitable recruits. The torpedo gunboat *Skipjack* has left here for Palmer's shipbuilding yard at Jarrow-on-Tyne, and where she is to undergo a thorough repair and be fitted with a new set of water-tube boilers at a cost of about £30,000. The crew which goes to Jarrow-on-Tyne in the *Skipjack* brought back the new third-class cruiser *Pegasus.* The new Brennan torpedo factory and stores is now an accomplished fact. The £45,000 which it was originally estimated would cover the expense of erection, has been exceeded by quite £10,000. The factory is now under the control of the War Office, and is practically a branch of the School of Military Engineering. The commissioning trial of the *Proserpine* was postponed, but she will before long leave Chatham for the North American and West Indies Station. The *Cossack* cruiser has paid off here, and it has been found that extensive repairs will be necessary, and that before the vessel is ready for another commission some £18,000 will have to be spent upon her. Some alterations have been made in the Medway Instructional Flotilla which now comprises the destroyers *Angler*, *Mallard*, *Contest*, *Sturgeon*, *Swordfish* and *Salmon.*

Pembroke Dockyard.

At this yard the *Andromeda*, *Spartiate*, and the Royal yacht continue to absorb the greatest amount of attention. A glance at the *Andromeda* before she steamed out of this yard would have convinced anyone that she was almost ready for commissioning. Very little now remains to complete her. There is very little about her which is incomplete, and much satisfaction was expressed at the result of the preliminary steam trial of the propelling engines. The *Spartiate* is to be launched on the 27th of this month, and all the men who were formerly employed on the *Andromeda* have been transferred to her in order to advance her as much as possible. Good progress continues to be made on the new Royal yacht, although the hands at work upon her have been considerably cut down. She has now had built into her nearly 1,000 tons, which is indeed a creditable state of affairs, considering the difficulties those in charge of her have had to contend with. All the frames and most of the beams throughout the hull are now in position, and the upper bottom plating for more than two-thirds of the length and up to the upper deck has been fitted. The order was given some time ago that she was not to be launched until she was in a forward and presentable condition.

A NEW ROTARY ENGINE.

THE success achieved by the rotary engines of the *Turbinia* in the enormous speed developed upon the propellers, which could scarcely be achieved direct by any form of reciprocating engine, will doubtless stimulate the ingenuity of inventors in the development of new forms of rotary engines; and we have pleasure in illustrating one form, particulars of which have been sent to us by Mr. Fernand Espir, 3, East India Avenue, London, E.C., and which is patented to Joseph Kamphues, of Amsterdam.

Many types of rotary engine have been patented and tested from time to time with indifferent success, but the desideratum to be achieved of an engine in which all parts rotate, and which at the same time shall be steam-tight as regards the working faces, is so great that we are not surprised at the persistence of inventors in trying to reach the goal.

In the engine we illustrate a good point has been scored in that the abutment or slide against which the steam reacts to produce pressure on the rotary piston L^1, enters and retires from the annular working cylinder M by the rotary action of the adjoining disc O^1, and not by a reciprocating action, which has been the fault of many rotary engines.

It is easily understood from the drawings that a working circular disc L is mounted on the shaft B, and carries in the annular chamber M the working piston L^1, of which the periphery and the entering neck of the disc is closed steam-tight by the spring packing L^2.

The annular chamber M is intersected at one part by a second annular channel O of exactly the same cross section, which carries the rotary slide O^1, completely filling its channel, which is made by the gearing KK to revolve at exactly the same speed as that of the disc L, so that the relative movements of the rotary slide O^1 and a cavity of N therein, which receives the piston L^1, always move in the same relation to one another as the main piston L^1 passes round. The annular chamber containing the piston L^1 has on each side of the point where the disc is in

FIG. 1.

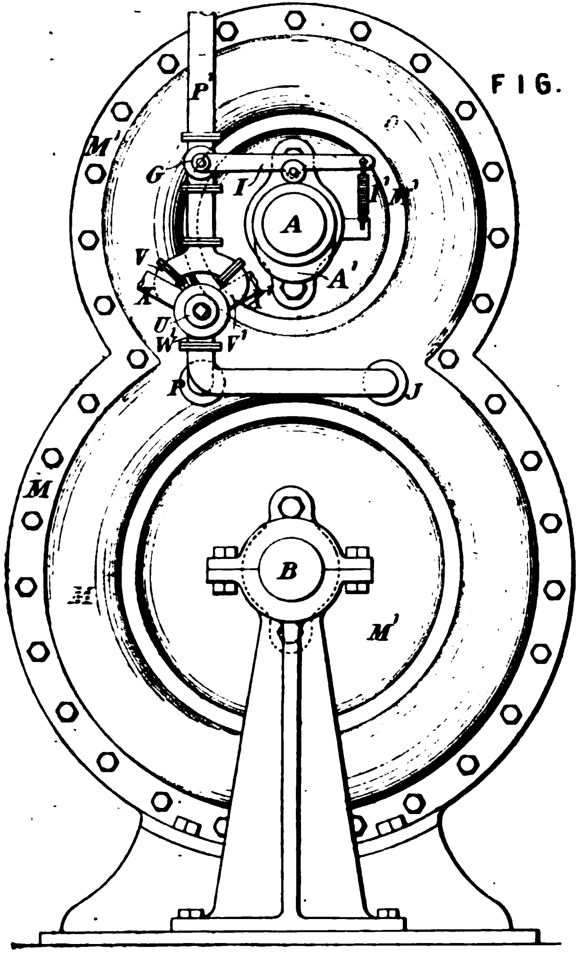


FIG. 2

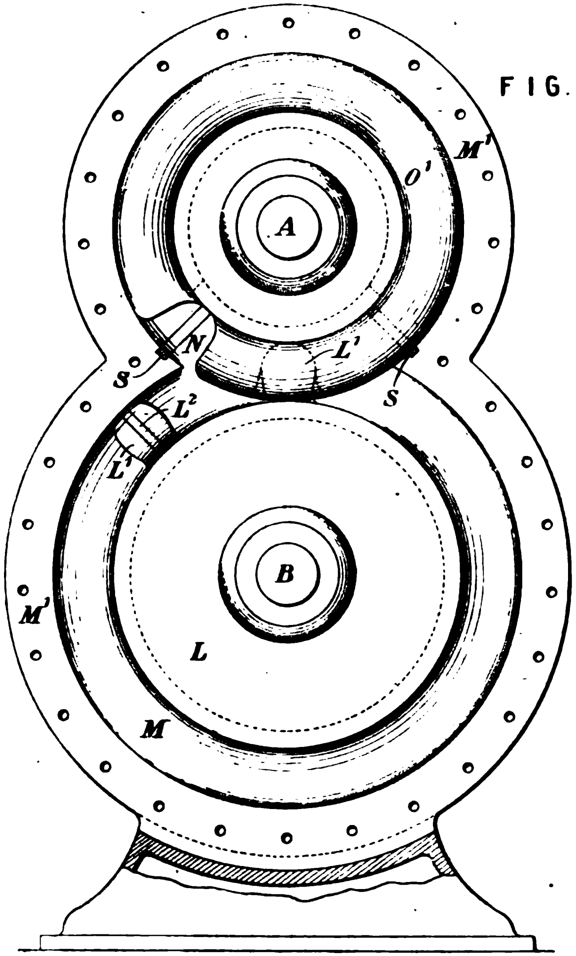
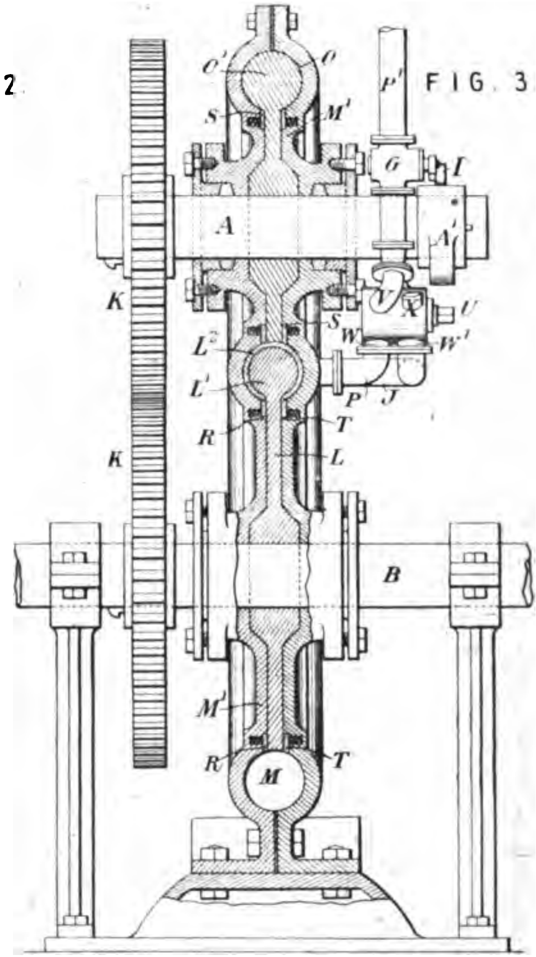


FIG. 3



A New Rotary Engine.

contact with the slide a lateral orifice P J, one of which forms the admission for the steam and the other the exhaust, divided from one another by the point of contact between the rotary slide O¹ and the disc L.

The steam thus acts after it has been admitted between the rotary slide O¹, as an abutment, and the piston L¹ for the whole of the revolution, until the piston L¹ uncovers the exhaust port before entering the cavity N, and the exhaust is effected during the next revolution of L¹ with a fresh charge of live steam between it and the rotary slide or abutment O¹.

Where it is desired to use the steam expansively any range of expansion can be obtained by a shut-off valve G in the supply-pipe operated by a cam A¹ on the axis A of the rotary slide or abutment, for a certain period of opening, and then closing by a spring T.

To reverse the engine the supply and exhaust pipes have merely to be transposed, which can be done by their meeting in a valve case with a four-way valve or cock U.

Two of such rotary engines can be compounded, as in reciprocating engines, to get highest ranges of expansion from high initial pressure, without too high a range in each cylinder, and a condenser could be used on the exhaust if desired.

The whole mechanism is characterized by simplicity, and has the advantage to which we have referred of all parts being rotary, and the steam admitted without waste clearance, which are vital points in a good rotary engine. The only practical difficulty we see in the engine is the maintenance of the steam packing tight on the working piston L^1, and the neck of the disc L, and the ensuring of a tight joint on the faces of abutment rotary slide O^1 and disc L.

MARINE ENGINEERS' NOTES.

THE hired transport steamer *Jelunga* (J. B. Stevenson, chief engineer), sailed from Southampton on the 27th August to the Mediterranean, this time with the Lancashire Fusiliers, a new regiment, and returned on 14th September with the 1st Battalion West Riding Fusiliers and a battery of Artillery, to be again dispatched on the 21st with the 1st Berkshire for Malta and thence to Mediterranean ports as required.

On August 12th, two days after his arrival from Yokohama, David Henderson, chief engineer, died at his home, Cardross Bank Villa, Cardross, Dumbarton. By a wide circle of friends much sympathy is felt for his bereaved widow and family. He was one of the early enrolled members of the Institute of Marine Engineers.

The *Golconda* (chief engineer, Jas. Y. Lowe), arrived from Calcutta in London on August 10th. This favourite passenger steamer for the East sails on September 30th, when the extreme heat of the Red Sea has passed and the season is more favourable for travelling. The *Golconda* is fitted with hydraulic power for working cargo, a desideratum in a passenger steamer carrying cargo.

The Hon. C. A. Parsons' steam turbo-motor has been fitted for ship's electric lighting as well as more recently to attempt to replace the main engines for the propeller shaft. One of them is fitted in the *Mombassa* (chief engineer, Thos. A. Baxter), which sailed from London for Calcutta on August 5th. The turbo-motor drives the dynamo direct at very high speed and has given considerable satisfaction since it was fitted about 1889.

The *Goorkha* (chief engineer, Robert Adam), arrived from Calcutta in London on August 25th with cargo and passengers and sailed again on September 16th.

The *Dilwara* (chief engineer, Peter Boyd), hired transport, sailed from the Albert Docks, on September 14th, for the Mediterranean, and was followed by the *Avoca* (chief engineer, W. D. Robertson), on the 16th, the former for Alexandria, the latter for Lagos and the West Indies.

The *Manora* (chief engineer, John Hall), arrived in London on September 6th with cargo and passengers and sails again in the middle of October.

The new steam yacht *Atmah* (chief engineer, Mr. J. Kirkland, M.I., Mar. E.), built on the Clyde by the Fairfield Co. has been lying at Southampton, having her saloon decorations completed. She left for France in the beginning of September, Baron Rothschild is the owner of the yacht.

The *Dunera* (chief engineer, M. Turnbull), left the Albert Dock on September 26th, being held in readiness for transport work when required in the service.

The annual dinner of the Institute of Marine Engineers takes place on Wednesday, October 12th, in the King's Hall, Holborn Restaurant. The reception will take place at 6.30 p.m., and the dinner will commence at 7 p.m. Mr. John Inglis, LL.D., of Glasgow, the President, will be in the chair, and a large and influential company is expected to be present. If we may judge from the former similar events commencing with that presided over by the late Dr. Peter Denny of Dumbarton (the first of the annual dinners) some eight years ago, the event will be a successful meeting in every way and a pleasant reunion. The session for reading and discussing papers on subjects of general interest to the members will commence shortly. Papers have been promised by Messrs. M. Paul, Dumbarton, the Rev. G. M. Capell and Messrs. J. G. Hawthorn, G. Halliday, etc. The papers on "Paddle Wheels" (A. E. Mills), "Notes on Boilers and Steam Pipes" (J. F. Walliker), and "Boiler Incrustation" (J. G. Hawthorn) are all printed and will shortly be issued to the members.

Mr. Aisbitt, Cardiff, was awarded the Denny Gold Medal for his paper on "Defects in Propeller Shafts," read during the session 1897-8.

In our last issue we called attention to the finding of the recent Science and Art Committee appointed to enquire into the workings of that Department by Parliament. Naturally we were interested in the whole of the enquiry; but more especially into the part relating to Marine Engineering not to be found in the evidence at all. We pointed out in our last issue that notwithstanding the long discussion at the meetings of the Institute, and the correspondence which has taken place between the Secretary of the Institution and the Board of Trade, nothing has been done but place a few words on paper. There are often six or more engineers in vessels of the Mercantile Marine, and only two of these need carry certificates of competency. A great number of our non-certificated sea-going marine engineers are responsible for the machinery of very large vessels during their watch; yet these need not, under the Board of Trade regulations, carry certificates of competency; nor need they have special training to fit them to discharge their duties and obligations. We have formerly advocated that these junior engineers should have, under the Board of Trade, inducements to better themselves by study to qualify for third grade certificates before they are allowed to fill responsible positions in the engine-room. Another letter has been addressed to the Board of Trade by the Institution of Marine Engineers urging attention to the subject of training. That the Board of Trade should not trouble to enquire or examine whether an engineer of the Mercantile Marine is competent to fill the responsible position is true, and pity 'tis 'tis true. But there seemed little hope of stirring up that Department, judging from the lapse of time since attention was directed to it, and so we turned to the Science and Art Department—which, though often wrong, always tries to do better. Engineers of the Mercantile Marine may or may not be thoroughly examined, our point is that they should be taught. And the technical teaching of the country is in the hands of the Science and Art Department. Well then, what is it that is wanted to bring Marine Engineers in closer touch with the Department? To what do the foremost men of light and leading of the Institute of Marine Engineers look forward? What is their aim and crown to be won in the future? Is it not that every British engineer who goes down to the sea in ships and fills a responsible position should be well educated, should take a pride in his engines, and should know intimately all the principles which underlie their action? This is their aim, and no one is better able, and let us hope more willing, to give a grant to further the work of the Institute of Marine Engineers in this direction than the Department. But one also wishes to see the training and education of engineers placed on a more sound basis than it is at present, and it is to the Department that one naturally looks for guidance in this. Sir John Donnelly has his faults, but above all he is a member of that body which produced Kitchener, which produced Gordon, and not least Captain Abney, who is an ornament to science. One does not know that there is any single body of gentlemen whose members have done so much for the making of England as the Royal Engineers. Anyway they have a reputation to keep, and Sir John Donnelly is one of them, and if ever the Council approach Sir John for guidance and assistance, it may not be in vain.

The news that the P. & O. steamer *China* had been floated at last about September 16th, would be received with considerabe gratification. The expense involved in the salvage operations have no doubt been very heavy, and the lesson pressed home on the insurance and salvage societies is, probably, that a national syndicate might be formed to undertake work which has hitherto been left to other competitors. If we mistake not, such a course was advocated in a paper, read before the Institute of Marine Engineers, on "Raising Wrecks," by Mr. T. Wailes, member.

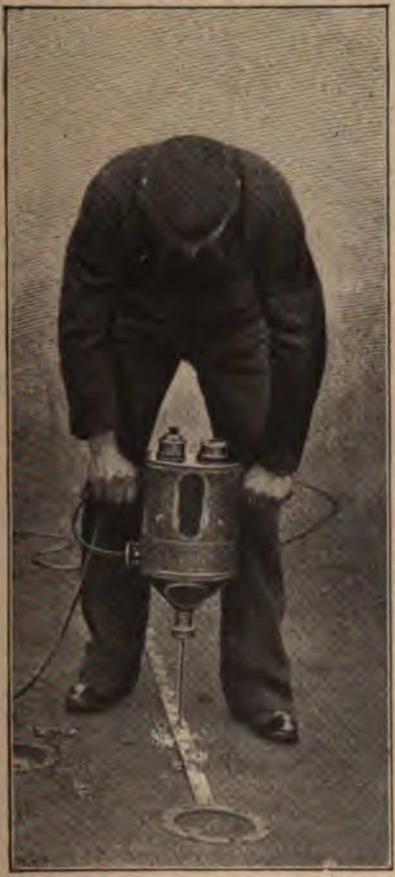
Messrs. Babcock & Wilcox have on order eight boilers for a large dredger for the Russian Government, two boilers for the Norwegian corvette *Ellida*, and they are at present having their boilers fitted in H.M.S. *Sheldrake*.

ELECTRICAL NOTES.

(*From our own Correspondent.*)

MR. WAGENHALS, the general manager of the Cincinnati and Miami Valley Traction Co., has been granted permission to experiment with electric traction on the Miami and Erie Canal, and should the experiments prove successful he is to receive the exclusive right to apply electric power in the traction of boats on the canal for 25 years. His method is by means of an ordinary motor car towing the boats, the car moving along the side of the canal. With a car using 20 ampères he towed two boats loaded with 80 tons each at a speed of 10 miles per hour, but this caused such a strong wave along the side that he has settled to do it at a speed of six miles an hour. The canal is 250 miles long, connecting Lake Erie with the Ohio. Its width is 60 ft. and depth 4 ft. The towing car weighs 20 tons and is to be not more than 6 ft. high.

MESSRS. SIEMENS BROTHERS, Woolwich, are introducing a new motor-driven ash-hoist which will be of great service to marine engineers and shipowners. The hoist is fixed in two side frames made of cast iron, which carry the small drum on which the rope connected to the ash bucket is wound. The side frames are fixed to the deck. The spindle of the drum is connected to the motor in the usual way. The same firm are also introducing electric deck drills, which are extremely simple in construction and convenient in application. The drills are capable of drilling holes up to $\frac{3}{8}$ in. diameter, and the weight of these hand drills are depended on for producing the driving pressure. The workman simply holds the drill by two handles at the sides and lets it down by its own weight. The speed of the electric motor is lowered by reducing gear inside the drill. There is also a large drill with a heavier motor in which the feeding arrangement is produced by a screw and small hand wheel or by the ordinary arrangement of the ratchet brace. There are three speeds to this drill and it can make hole up to 2 in. diameter.



THE Palace Line of steamers had lately trouble with heat fog in the Channel, and the accident to *La Bourgogne* has caused some suggestions to be made for experiments on the power of electric discharge to clear fog. It appears that when Professor O. Lodge was crossing from this country to the meeting of the British Association in Montreal, he was detained for several hours in his passage in consequence of a thick fog. He subsequently pointed out that where electricity was discharged into a fog on a small scale the fog coagulates into globules and falls as rain; and he suggested that since there were on board donkey engines which could drive very powerful Holtz and Wimshurst machines, one pole of which might be led to points in the masts, the discharge could be made into the air. Another suggestion is made to utilize the dynamo machines on board to generate, through suitable transformers in series, current at very high potential and discharge it into the air.

THE yacht *Atmah*, built on the Clyde for Baron Edmond Rothschild, has a most complete electrical equipment, which includes a telephone outfit with cable to connect it to the exchange of any port she may be in.

OBITUARY.

SIR WILLIAM GRAY.

IT is with sincere and profound regret that we have to record the death of Sir William Gray, the head of the great shipbuilding firm, Sir W. Gray & Co., of West Hartlepool, which took place on Monday, September 12th, at his residence, The Cottage, Greatham, as the result of a paralytic seizure.

Sir William Gray was the younger son of Mr. Matthew Gray, a draper of Blyth, and was born in 1823. After being educated at Dr. Bruce's academy at Newcastle, he chose his father's business, was apprenticed to him, and after serving his time, spent a brief period in a fashionable drapery house in the West End of London. When barely of age, he commenced business for himself in High Street, Hartlepool, and carried it on most successfully for 17 years, when he sold it to his then assistants, finding that the comparatively humdrum sort of occupation did not furnish sufficient scope for his energy. Thus it came about that following the example of his father he invested his capital in ships, which brought him into acquaintance with Mr. John P. Denton, a shipowner and a builder of wooden vessels at the port of Hartlepool.

The change of material for shipbuilding from wood to iron in the sixties, decided these gentlemen to create a partnership which resulted in the development of the establishment of the firm of Denton & Gray at the Middleton shipyard belonging to the former, from which, in 1863, they launched their first vessel, the sailing ship *Sepia*. The firm subsequently took over a larger yard at West Hartlepool, which had good graving dock facilities. In 1872, the death of Mr. Denton led to the reconstruction of the firm under the title of Messrs. Wm. Gray & Co. In 1877, and again in 1878, the firm were the largest producers of tonnage in the kingdom, and though they have been later in this respect beaten by Palmers', of Jarrow, and one of the Clyde firms, the position of the chief West Hartlepool yard is still a high one in the roll of the shipbuilders of this country. In all the firm has constructed more than 700 vessels, the great majority of which have been steamers.

Some years ago Sir William Gray, in conjunction with other capitalists, established the Central Marine Engine Works at West Hartlepool, in order that the firm might engine their own ships, these works now employ 1,500 hands. About two years ago, on the death of his son, Mr. Matthew Gray, he took over the West Hartlepool steel and iron works, which employ about 1,000 hands. The aggregate amount distributed in wages per week in the various works reaches to about £10,000.

Sir William Gray had all the characteristics of a great commercial pioneer, and by his own indomitable energy and perseverance raised himself from a position of obscurity to an eminent position among his commercial confrères.

In 1849 he married Dorothy, the daughter of the late Commander Hall, R.N., and sister of Mr. John Hall, the head of the well-known London firm of shipowners, and representative on Lloyd's Committee of the Hartlepool Chamber of Commerce.

Sir Wm. Gray took a keen interest in municipal matters, and his career in such is bound up with the later history of the ancient

From a Photo taken by Mr. T. G. Gamlen, Church Street, West Hartlepool.]

THE LATE SIR WM. GRAY, WEST HARTLEPOOL.

borough of Hartlepool, and is almost entirely co extensive with the municipal life of West Hartlepool. He was elected mayor of Hartlepool in 1862, and re-elected in the following year. In 1887, when West Hartlepool received its charter of incorporation, he was elected the first mayor.

Sir William Gray, in conjunction with Mr. George Pyman, originated in 1868 the oldest and largest of the marine insurance companies, the East Coast Iron Steamship Association.

The "well-deck" type of steamer was practically the creation of Messrs. W. Gray & Co., of which type the firm have built a large number of vessels.

Her Majesty the Queen on May 28th, 1890, was pleased to confer the dignity of knighthood upon the deceased gentleman, in recognition of the conspicuous services he had rendered, not only to the people of Hartlepool and its surroundings, but to the commercial supremacy of the country. Sir William Gray was very benevolent; he gave very handsome sums to the Presbyterian churches with which he was connected throughout his long life. He actually paid three-fourths of the debt resting on the churches within the newly-formed Darlington Presbytery, which then extended from Hull to the Wear.

THE INSTITUTION OF MARINE ENGINEERS.

THE FIRST DECADE.

THE supremacy of England depends on her Navy and on her Mercantile Marine, which is equivalent to saying that it depends on her marine engineers. In Wales there was this year a coal war and there could be no Naval Manœuvres. Both the vessels of the Mercantile Marine and the Navy depend entirely for their movements on her marine engineers.

Though all England depends for its supremacy on this important body of men, it was but recently that they formed themselves into an Association. Formerly they knew but little of each other. Formerly they met only in an accidental way when a short time ashore. When they met they had no common bond or meeting place. Though the marine engineers were of supreme importance in the country they were simply units without a common voice. It was under such conditions that the following gentlemen met some time in the early winter of 1888. The enthusiastic spirit of the movement was probably Mr. Jas. Adamson, of the British India Co., who drew up the first circulars which were issued announcing the initiation of the Institute. But the following gentlemen met and drew up a constitution for the Institution:—Messrs. J Adamson L. P. Coubro', D. Greer, J. G. Hawthorn, R. Leslie, H. Prior, M. Prior, F. W. Shorey, and J. H. Thomson.

About the time that these gentlemen met and discussed and formed a constitution of association there was a great trades' union movement afoot in England. There was thus a great temptation before them to make the movement drift into lines which would leave its mainspring simply an association for the increase of wages. It was fortunate for the future and the usefulness of the Institution and for England that its initiation was due to the above gentlemen, for they saw the dangers of the movement and they resolved to have the whole affair raised into a higher plane. They chose that the association should be ethical rather than mercenary. They thought themselves, and rightly, on a level with the Naval architects, with the engineers and shipbuilders in Scotland, and other learned associations. They elected to consider that an association of marine engineers must look to the welfare of the country rather than of themselves as individuals. They looked on the whole matter from the patriot's point of view rather than that of the individual. And so it came about that the work of the association was to be that of an organised body of educated and skilled men improving the marine engineering of England by the reading of practical and scientific papers and by the association of themselves with all that was best in the intellectual and social life of England. But here is the exact resolution which they came to ten years ago:—

"To unite in one body all the scientific and practical men ashore and afloat connected with marine engineering." The original circular said: "It has been considered highly desirable to form an institution, and that for marine engineers, having for its objects the promotion of those intellectual and social qualities which render life more honourable and pleasant to their possessors."

The Memorandum of Association is as follows:—

1. The name of the Association is "The Institute of Marine Engineers."

2. The registered office of the Association will be situated in England.

3. The objects for which the Association is established are:—

(*a*) To promote the science and practice of marine engineering in all its branches.

(*b*) To enable marine engineers to meet and correspond, to facilitate the interchange of ideas respecting the improvements in, and original and improved methods of working, machinery, and the publication and communication of information on such subjects.

(*c*) To maintain and improve the status of marine engineers and the profession of marine engineering, to afford facilities for education, study, and self-culture to marine engineers, and to promote their progress in advancement in a knowledge of their profession.

(*d*) With a view to carrying out the objects aforesaid, to establish and carry on in Institute premises and premises in connection with the Institute, and thereon to supply to members and persons entitled to attend meetings of the Association, and on complying with all conditions required by law, refreshments and accommodations of all kinds, to charge reasonable and proper sums for such refreshments and accommodation, and to enforce payment of such sums.

(*e*) Subject to the provisions of the 21st Section of "The Companies Acts, 1862," to acquire, borrow, lend, and dispose of property aforesaid.

The names, addresses and descriptions of subscribers are:—

Adamson, Jas., engineer, St. Quivox, Stopford Road, Upton Manor.

Beldam, Asplan, engineer, The Lodge, Acton.

Coubro, L. P., engineer, 13, Park Villas, Charlton Road, Blackheath.

Craig, William Jeffers, M.Inst. N.A. & C.E., Earlham Grove, Forest Gate.

Domoney, J. W., merchant, Montrose, Balham Park Road, S.W.

Gray, John Macfarlane, chief examiner of engineers, Board of Trade, 1, Claremount Road, Forest Gate.

Leslie, Robert, engineer, Mayfield, Sprowston Road, Forest Gate.

Manuel, George W., engineer, Eildon, Catford, Kent.

Rait, Henry M., engineer, 1, Nester Terrace, N.W.

Thomson, John H., engineer, 26, Ethel Road, Victoria Docks.

The Constitution. The Institute is composed of Members, Associate Members, Associates, Graduates, and Honorary Members.

Members. The qualifications for membership are that they must be engineers, possessing first-class Board of Trade certificates, and who have, in addition, occupied the position of chief or second engineer during a period of not less than twelve calendar months prior to the date of their application for membership, or in the alternative they must be engineers in virtue of their education and experience, who occupy or have occupied, responsible positions on shore in the designing or construction of machinery in connection with marine engineering, or in the directing or carrying on of work connected with marine engineering.

2. *Associate Members* must be engineers possessing second-class Board of Trade certificates, and have in addition, had charge of a watch at sea during a period of not less than eighteen calendar months prior to the date of their membership, or in the alternative they must be engineers in virtue of their education and experience who occupy or have occupied some semi-responsible position on shore in the designing or construction of machinery in connection with marine engineering.

3. *Associates* must be gentlemen not under the age of twenty-one years, who by virtue of their education and experience are engineers, and who follow or propose to follow the occupation of marine engineer.

4. *Graduates* must be apprentices to the science, profession, trade, or business of engineering who have served as such apprentices during a period of not less than three years prior to their application for membership, and who propose to follow the occupation of marine engineers.

The Council shall have power to elect as honorary members, peers, members of Parliament, persons holding high civic or other distinguished positions, or influential persons connected with or interested in engineering, subject to such regulations as the Council shall, from time to time, decide.

For a movement like this money was wanted, and it fell to the late Mr. John Tait, the then commodore engineer of the British India Company, to have the honour of first taking from his pocket a sovereign and placing it on the table. After this, money flowed in to give it a start.

The committee then selected Mr. James Adamson to fill the office of honorary secretary, and the success of the Institute during the last ten years shows that the confidence of the early founders was well placed. Indeed too much praise cannot well be bestowed on the honorary secretary. If any should possess the engineering instinct it should be Mr. Adamson, for his father, and his grandfather before him, were Aberdeen shipbuilders. He was born in Stirlingshire, educated at Dollar Academy, and apprenticed at Falkirk and Glasgow. While in Glasgow he studied at the University for three years. Mr. Adamson always has been an Altruist. Indeed, it is the basis of his nature. Even when but a young man he was an officer of the Glasgow Foundry Boys' Society. Coming to the centre of life in London he was for some time engaged as a draughtsman and afterwards went to sea for experience as an engineer. When he returned he brought with him a fund of information and objects of interest with which he has delighted the city arabs and Sunday-school children of Glasgow. He was ultimately engaged as draughtsman and assistant to the late Mr. Malcolm Campbell, superintendent engineer to the British India Steam Navigation Company.

It has been a feature of the Institute that its presidents have each received some honour after being nominated or while they were in office. If one scans their career, however, this is hardly to be wondered at, since, being successful men, some honour falls to their lot almost every year.

The first president, Mr. Asplan Beldam, was a marine engineer bred to the business. He is now head of the Beldam Rubber Packing Co., the Corrugated Metallic Valve Co., and the Beldam Foundry Co. Born in 1841, the son of a Huntingdonshire farmer, apprenticed at sixteen to Kitson, Thomson, and Hewitson's locomotive engineering works at Leeds, he went to sea as a marine engineer immediately he had finished his apprenticeship. During 1865-66 he designed machinery for the great chemist Mr. Alexander Maubré for the making of gleucose sugar and saccharine and he made the manufacture a success although former machines made by other engineers had often been complete failures. The machinery is now extensively used for sugar, and also for the distilling of spirits under the new process. In 1867 he was appointed manager of the shipbuilding and engineering works at Northfleet, and two years later, 1869, he became manager of Geo. Forrester & Co.'s Works, Liverpool. In 1872 he became superintendent of the Flower Line, and in 1876 consulting engineer and naval architect. In this capacity he became consulting engineer to the Castle Line; Money, Wigram & Sons, Limited; Eastern Telegraph Co., Eastern Extension Australasian and China Co., the Scandinavian Steamship Co., and others.

He designed and built the tea ship *Stirling Castle*, which made the record passage home with 6,000 tons of tea in 28 days. In 1867 he designed and engined two vessels for a pressure of steam of 110 lbs., and in 1871 he patented a marine boiler to take a pressure of 150 lbs. So that he was a pioneer of the high-pressure steam movement. He is a member of the London Chamber of Commerce, a member of the Naval Architects; of the Mechanical Engineers. He has been awarded gold medals and certificates for useful inventions.

The second president was Mr. G. W. Manuel, who was educated at the High School, Edinburgh, and Madras Academy, Cupar Fife. He was apprenticed to Mr. Hathgate, millwright, Selkirk, and completed his apprenticeship at Randolph, Elder & Co., Glasgow. Mr. John Elder took notice of him as an apprentice, and gave him the position of junior draughtsman. In 1855 he was apprenticed junior engineer in the P. & O. S. N. Co., and afterwards assistant and draughtsman to the superintendent. He was appointed, in 1866, chief engineer of the company, and in 1876, appointed Lloyd's surveyor at Newcastle, where he conducted experiments which led to the adoption of mild steel for boiler construction. In 1880 he returned to the P. & O.

(*To be continued.*)

Miscellaneous.

The Verbal Questions and Answers which are given at the Board of Trade examinations for engineers have been compiled by a Marine Engineer and Teacher of many years' experience, and are now published in book form. The book is divided into two parts, one being devoted to boilers and the other to engines. Part 1 deals with fuel, draught, water and steam, and goes minutely into the functions of each. The details of construction of boilers, together with the characteristics and objects of the various fittings on the boiler are carefully set out. Part 2 deals with the various types of engines, detailing the feature of the slide valves and explaining the lap, lead and other characteristics. Questions and answers are also given on the propeller shafting, pumps and valves. It should be a useful book to engineers in preparing for the Board of Trade examinations, and also as a simple and ready means of imparting to young engineers beforehand much of the practical knowledge required of them when they go to sea. The book is published by Mr. A. Ritchie Leask, Publisher, 95, Minories, London, E.

On September 13th Messrs. Harland & Wolff launched at Belfast the fine steel-screw steamer *Manhattan*, the first of the large new vessels under construction for the National Steamship Co., Limited, trading between London and New York. The vessel is 500 ft. long by 56 ft. beam. and her gross tonnage about 8,000. She will be lighted throughout with the electric light, and will have every facility for rapid loading and discharging of cargo. A shade deck will be fitted up for cattle. The machinery for propelling the vessel will consist of two sets of triple-expansion engines.

America Maru.—The large twin-screw passenger and cargo steamer, which has been built to the order of the Toyo Kisen Kabushiki Kaisha, better known in this country as the Oriental Steamship Co. of Tokio, Japan, by C. S. Swan & Hunter, Limited, was taken out to sea on Friday, September 23rd, for her official trial trip, which proved highly satisfactory in every respect. This steamer has been built for the special mail and passenger service between Japan, Hong Kong, and San Francisco under subsidy from the Japanese Government. She is a handsome vessel, with her white hull and cut-water stem, and she looked more like a large yacht than a trading steamer. Her leading dimensions are:—Length, B.P., 412 ft.; breadth, 50 ft. 9 in.; and depth, moulded, 32 ft. 6 in. On the top of the bridgedeck there is a large steel house built round the engine and boiler casings at the fore end, of which in the centre is situated a large social hall, decorated in light carved oak, through the centre of which is an opening giving light and air to the dining saloon beneath; over this is a very handsome dome skylight. On the starboard side of this social hall is a ladies' private cabin and boudoir, and on the port a comfortable suite containing sitting-room, bedroom, and bath. Just abaft this room is the entrance hall, giving access to the deck below. On each side of the engine and boiler casings in this house is an alley-way giving access to the first-class state rooms, the bulk of them being on this deck. A special feature here is that each pair of state rooms have a direct exit to the deck. At the after end of this house is the smoke room, which also is decorated in oak, and contains the usual marble topped tables and fittings. Over this house the deck is carried the whole width of the ship, the boats being carried on the rails, the rest being left clear for promenade. At the fore end of this deck stands the captain's chart and wheel houses with the flying bridge above. On the upper deck at the fore end of the bridge are the rest of the state rooms, aft of these is the dining saloon, which is fitted out in different shades of oak, the panelling being artistically carved in the same wood. Accommodation is provided for about 90 first-class passengers in these rooms, and has been specially designed to be roomy and well ventilated for the tropics. The remainder of the bridge is taken up by the officers, engineers' pantry, gallies, &c. At the forward end of the poop is the second-class dining saloon, which is panelled out in polished hardwoods on one side, at the forward end is placed the pantry, and on the other the ladies' room. The remainder of the poop is occupied by the second-class state rooms, which, like the first-class, are roomy and well ventilated, and will contain in all about thirty passengers. In the forecastle and below on the main deck berths are provided for 230 coolies, the whole of the beds being of iron. The crew and firemen are berthed aft on the main deck with an entrance from the after well, thus keeping them well away from the passengers of all classes. The whole of the weather deck, including the boat deck, are of seasoned teak. The vessel is, of course, lighted throughout with electricity, including the mast-head and side-lights, the dynamos being in duplicate to guard against breakdown. Refrigerating machinery connected with a large chamber has also been fitted, so that fresh provisions may be always served. The machinery, of which a description follows, has been supplied by the Wallsend Slipway & Engineering Co., Limited, and drove the vessel on the trial trip, when loaded down to a draught of 20 ft., a speed of 17½ knots. This consists of two sets of independent triple-expansion engines, having cylinders 28½ in., 46 in., 75 in. by 48 in. stroke, steam being supplied by five multitubular boilers, four double ended and one single ended, 180 lbs. working pressure. The machinery has been built under the superintendence of Messrs. Flannery, Baggallay, & Johnson, London, and is complete with every modern appliance to ensure the efficient and economical working of the machinery, such as Weir's independent feed pumps, evaporators, See's ash ejector in each stokehold, separate centrifugal circulating pumps, feed water filter, bronze blades, &c. The contract conditions as to speed and power were carried out on the trial without a hitch, and the guaranteed speed of 16½ knots was exceeded by one knot.

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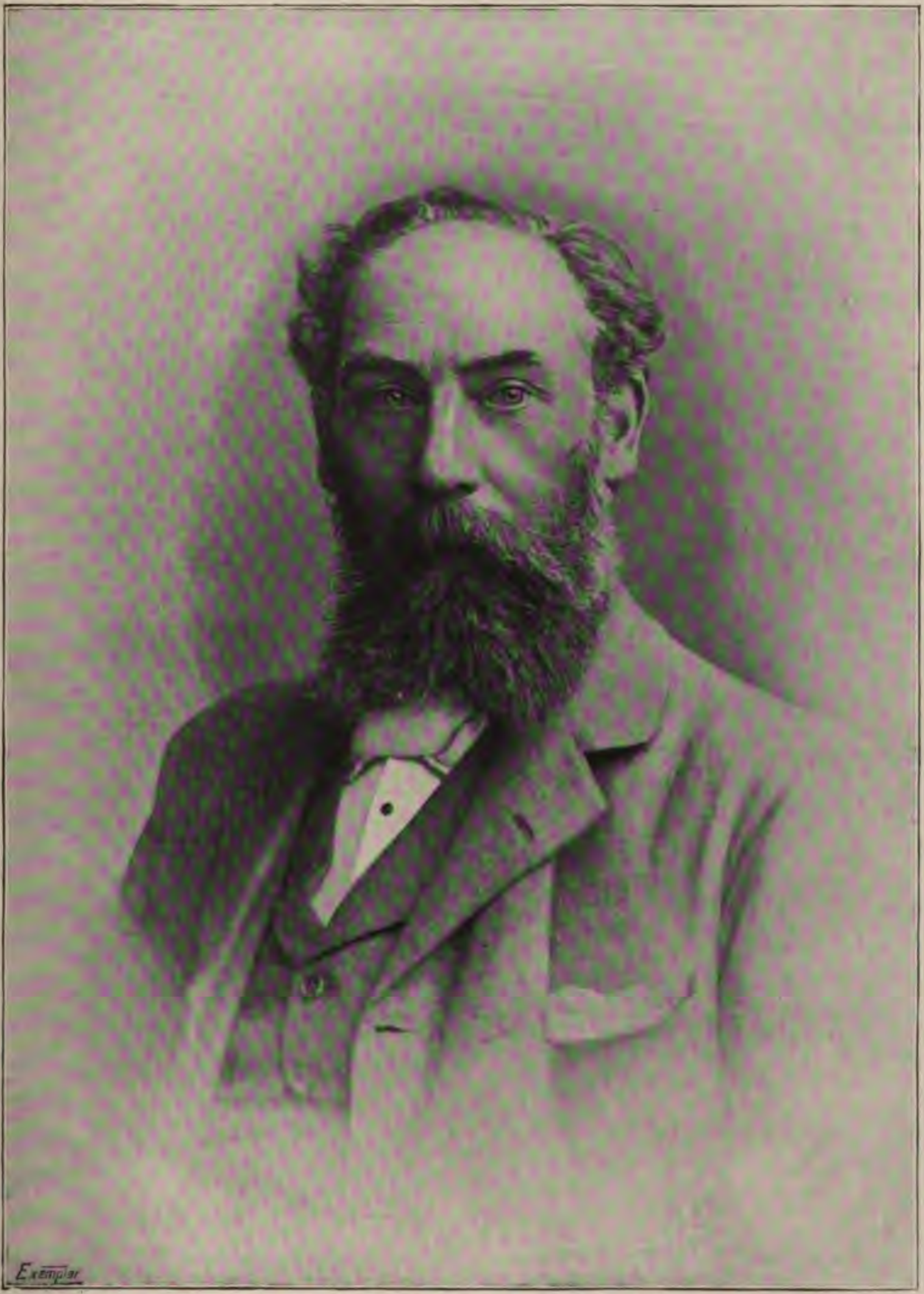
ASTOR, LENOX AND
TILDEN FOUNDATIONS.

From a Photo taken by Messrs. Barrauds, Limited, 263, Oxford Street, London.]

JOHN INGLIS, ESQ., LL.D., PRESIDENT OF THE INSTITUTE OF MARINE ENGINEERS.



From a Photo taken by Messrs. Brown, Barnes & Bell, 12, Baker Street, Portman Square, London.]

JAMES ADAMSON, Esq., Hon. Sec. of the Institute of Marine Engineers.

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ASTOR, LENOX AND
TILDEN FOUNDATIONS.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from August 26th to September 24th, 1898 :—

Abbott, Henry, engineer to the *Victory*, additional, to date Sept. 1st.

Baker, Ernest F., assistant engineer to the *Proserpine*, to date Sept. 7th.

Bartlett, Ernest E.†

Bath, Geo. C., chief engineer to the *Pembroke*, for the *Cossack*, in reserve, to date Sept. 15th.

Bermingham, H. A., engineer to the *Vernon*, additional, to date August 27th.

Bills, Walter W., assistant engineer to the *Peacock*, to date Sept. 22nd.

Block, Robert J., engineer.*

Chisman, Edward, engineer *

Colman, Arthur W., assistant engineer to the *Sans Pariel*, to date Aug. 17th.

Crichton, Wm. H., engineer.*

Daves, Henry F., engineer to the *Nile*, to date August 27th.

Dellbridge, Wm. A., artificer engineer to the *Excellent*, additional, to date September 2nd.

Donkin, Collingwood F. L., engineer to the *Prince George*, to date September 1st.

Duke, David E., assistant engineer (temporary), to the *Salamander*, to date September 15th.

Durston, Geo. H., assistant engineer to the *Victory*, for the *St. George*, undated.

Durston, Geo. H., assistant engineer.*

Edmonds, Percy L.†

Evans, Harry, assistant engineer to the *Nile*, undated.

Ewart, Arthur E.†

Freeman, B. F., probationary assistant engineer to the *Nile*, to date August 27th.

Garwood, Harry T., engineer to the *Victory*, for the *Spiteful*, to date September 1st.

Gaudin, Edouard, chief engineer to the *President*, additional for the *Stag*, to date September 1st.

Gordon, Francis A., assistant engineer.*

Grant, Henry W., assistant engineer to the *Trafalgar*, to date August 29th.

Haddock, Sidney G., chief engineer to the *Proserpine*, to date September 7th.

Hall, Arthur C., assistant engineer to the *Trafalgar*, to date August 29th.

Hall, Charles R., engineer to the *Magdala*, to date August 27th.

Hambly, Wm. J., assistant engineer to the *Collingwood*, to date September 2nd.

Harris, Herbert W., engineer to the *Melita*, undated.

Hart, Alfred, chief engineer to the *Pembroke*, for the *Gleaner*, undated.

Head, Ernest A. W., engineer to the *Daphne*, to date September 22nd.

Hearn, John H. C.†

Heyes, Henry W., engineer.*

Hills, Alfred, engineer to the *Pembroke*, for the *Comus*, to date September 1st.

Hobbs, Lionel M.†

Hughes, James.†

Hyne, Arthur E.†

Irish, Herbert W., engineer to the *Victory*, additional, to date September 1st.

Kerr, J., staff engineer, advanced to the rank of fleet engineer in her Majesty's fleet.

Kerr, John, staff engineer to the *Victory*, for the *Latona*, to date August 30th.

King, Q. W., staff engineer to the *Vivid*, for the *Highflyer*, to date August 30th.

Kirwin, Joseph J.†

Little, Herbert J., engineer to the *Majestic*, to date September 1st.

Longland, Wm. E., probationary assistant engineer to the *Camperdown*, to date September 2nd.

Main, Chas., probationary assistant engineer to the *Majestic*, to date September 2nd.

Martin, Geo. R.†

McKinlay, Alfred W.†

McNorris, C., chief engineer, to be staff engineer in her Majesty's fleet.

Messervy, Chas. de F., assistant engineer to the *Nile*, to date August 29th.

Metcalfe, Henry W., engineer to the *Cæsar*, additional for the *Earnest*.

Metcalfe, Henry W., engineer to the *Dido*, for the *Earnest*, to date September 15th.

Mew, William H., probationary assistant engineer to the *Sans Pareil*, to date August 17th.

Misselbrook, Sidney G.†

Mitchell, William H.†

Moss, Frank S., engineer to the *Magnificent*, to date September 1st.

Murray, J. A., chief engineer, advanced to the rank of staff engineer in her Majesty's fleet.

Nicholson, James B.†

Parnall, Walter R.†

Parrott, Jasper W. A., engineer to the *Pembroke*, to date September 1st.

Pearce, Richard S., probationary assistant engineer to the *Hood*, to date September 2nd.

Percy, John J. G. G., engineer to the *Victory*, for the *Wizard*, to date Sept. 22nd.

Pleming, J. W., chief engineer, to be staff engineer in her Majesty's fleet.

Pratt, William H., engineer.*

Rampling, H. J., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's fleet.

Reid, Walter S., assistant engineer to the *Trafalgar*, to date August 29th.

Roberts, Ivor E. S., assistant engineer to the *Vulcan*, to date September 2nd.

Rook, Herbert E., assistant engineer.*

Roffey, James R., engineer.*

Rosevere, William H., assistant engineer to the *Thunderer*, to date August 27th.

Russell, Charles S.*

Sanders, Wm. C., engineer to the *Pembroke*, additional for the *Albatross*, to date September 1st.

Shaw, J. F., probationary assistant engineer to the *Thunderer*, to date August 27th.

Shillcock, Arthur E., probationary assistant engineer to the *Ramillies*, to date September 2nd.

Sillince, William P., assistant engineer.*

Skelton, Reginald W., engineer to the *Anson*, to date September 2nd.

Smith, Henry F., assistant engineer to the *Alexandra*, to date September 1st.

Steil, W. J., assistant engineer.*

Stevens, Charles, engineer to the *Wildfire*, for the *Janus*, to date September 1st.

Stone, Alfred T. H., engineer to the *Illustrious*, for the *Griffin*, undated.

Stone, Alfred T. H., engineer to the *Isis*, for the *Griffin*, to date September 15th.

Stry, Frederick M. D., chief engineer to the *Salamander*, to date September 15th.

Sutton, Arthur W., engineer to the *Victory*, for the *Crescent*, to date September 2nd.

Swinney, Edward, chief engineer to the *Vivid*, for the *Gipsy*, to date September 1st.

Talbot, John C.†

Underhill, C., staff engineer, to be fleet engineer in her Majesty's fleet.

Vining, Henry P., chief engineer to the *Hibernia*, for the *Rainbow*, in reserve, undated.

Wheater, Percy, engineer.*

Wickham, Harry J.†

Wisnom, W. McK., has been appointed to the rank of chief engineer in her Majesty's fleet.

Wolfe, Henry E., probationary assistant engineer to the *Anson*, to date September 2nd.

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† To be lent for study at the R.N. College, Greenwich, to date September 30th.

* To the *Vernon* and *Excellent*, for courses of torpedo and hydraulic instruction, to date September 24th.

Messrs. McKie & Baxter have just secured the order for a set of twin-screw machinery for a passenger steamer. The boiler will be Thom's patent water-tube and is being specially built by Messrs. Muir & Houston, Limited.

HOAR & BROWN'S HARDWOOD MARKET REPORT, SEPTEMBER 20th, 1898.

TEAK.—The deliveries have fallen short compared with the same month last year, but large orders have been taken from landed stocks during the last fortnight, which will show in next month's stock-taking, and make a considerable difference. Prices are very firm for first-class goods, although some of the figures at which supplies have lately changed hands appear low, the mixture of some second-class goods assisted in reducing the price. There is still a considerable quantity of low-priced stock on the London market, and quotations can be made at a reduction of quite £2 per load under the present floating figures. This can, of course, only be done with cargoes of last year's arrival when cost prices were considerably weaker. There has been little demand for floating cargoes.

TEAK PLANKS.—Although the stock continues fairly heavy values appear to have an upward tendency, and each consignment arriving maintains superiority over the previous one to the extent of an extra half-crown per load. The high figure charged for ordinary specifications will in time force teak out of consumption, and other woods will be used instead which soon drives down prices and causes a complete slump. This kind of thing happens about every ten years, and the time is now close upon us.

If shippers could moderate their shipments and keep prices fairly even, say from £11 to £13, they would enjoy a good continual harvest instead of periodically making business impossible.

MAHOGANY.—The trade has greatly fallen off during the last three months, causing a decline in prices all round, but an improvement is looked for with the autumn and good class wood will fetch the usual high prices before the year has expired. Cuba logs are still scarce and very expensive, and St. Domingo follows in the same groove. African is still in general use and the prices for this are exceptionally low, small sound logs selling at 2¾d. to 3d. per foot.

SEQUOIA.—Prices are not quite so firm in consequence of some arrivals which are expected shortly.

KAURI PINE.—Sales are very slow, there is no improvement in prices, and the stock is overdone.

American Lumber of all kinds is more or less a drug, values being very low.

GREENHEART.—The business has practically left London, although some very low quotations are being quoted from stocks here.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

GENERALLY speaking the steel trade of the west of Scotland has seldom been so prosperous as it is at this moment. Ships' plates and angles have touched about £6 10s. per ton, a figure they have not reached since the piping times of 1890-91. The mills are working at their fullest capacity, and extensions are projected on every hand; withal, deliveries cannot be made to meet the demand. The weekly output of the various works has been averaged as follows:—

	Tons		Shipbuilding Material
Dalzell	2,550	of which	2,500
Wishaw	1,600		1,600
Blochairn	1,400		1,100
Glengarnock	1,300		100
Clydesdale	1,260		1,260
Clydebridge	1,160		1,150
Newton	1,100		1,000
Mossend	1,100		1,100
Parkhead	1,070		950
Lanarkshire	900		700
	13,430		11,460

These figures are very instructive; they show that out of a total weekly output reaching probably 14,000 tons, nearly 12,000 are shipbuilding material. They are eloquent of the condition of the shipbuilding industry.

From a recent estimate of the tonnage on hand in the Clyde district, it is evident that there is no less than 450,000 tons of merchant shipping and 95,000 tons of naval shipping underway, or a grand total of 545,000 tons. In the Greenock and Port-Glasgow district alone the shipbuilding tonnage amounts to 185,200 tons, one firm in that district—Messrs. Russell & Co.—having as much as 62,000 tons on hand. The Fairfield Co. are credited with 73,000 tons, the Clydebank Co. with 59,000, Messrs. Denny & Bros. with 30,000, Messrs. Scott & Co. with 29,000, Caird & Co. 29,000, C. Connell & Co. 27,000, A. Stephen & Sons 26,000, Barclay Curle & Co. 25,000, R. Napier & Sons 23,000, London & Glasgow Co. 21,000.

The Scottish iron and steel manufacturers have formed a federation for the purpose of dealing with future demands of employes. The federation will not regulate selling prices, but will be ready to oppose any demands of workers which may be considered unjust. This federation will enable the shipbuilding, engineering, and iron and steel trades to act in unison, and practically unites the leading trade interests in Scotland.

The Steel Co. of Scotland, Limited, in their annual report for the year ending 14th July, state that the balance sheets and accounts are again of a satisfactory character. The past year has been one of unexampled activity. Both Newton and Blochairn works have been fully employed, and the output of finished steel exceeds that of 1897, which was a record year in the history of the company. The realised price of plates, angles, etc., was practically the same as that of last year, as, notwithstanding the extreme pressure of work, it was difficult to obtain higher prices owing to excessive competition. It was only in the later months of the year that any substantial advance was obtained, but too late to affect materially the average of the year. In pursuance of the policy adopted last year, the directors place £20,000 to reserve fund account, and from the balance of £25,612 6s. 8d. they recommend that £22,302 be appropriated to the payment of a dividend on the paid-up capital of the company at the rate of five per cent. per annum, free of income tax, and that the balance of £3,310 6s. 8d. be carried forward to the present year.

At the annual general meeting of the Steel Co., held later in the month, Sir Charles Tennant, president of Directors said they met under happier auspices than on the last occasion or on many occasions previous to that. The directors had been able to pay a dividend of five per cent. and make provision for strengthening materially the position of the company. This was more satisfactory than it looked, because it arose not so much from improved prices as from the benefits derived from reconstruction and from economical and efficient working throughout. He hoped they might regard this improvement in their position as one they could depend upon in the future management of the company. For this they owed a debt of gratitude, not only to the Board but to the secretary and to the heads of the technical departments. For the coming year their prospects were quite satisfactory, and they had many orders in hand.

What became practically a universal strike of rivetters throughout Clyde yards began with the beginning of the month, and it was not until about mid-month that the disaffected operatives resumed their duties, although from the first they were commanded to do so by their own Executive. The trouble was in connection with the revised price list which had been arranged in conference with delegates from both the ranks of the employers and employed and which came into force concurrently with the advance of wages on the 26th August. The men had evidently taken it into their head that the price list had been arranged without due consultation with them, and that in fact they had been properly overreached. According to their assertions, instead of being blessed with an advance of wages on the 26th August, they were virtually asked by the introduction of the new price list to submit to a reduction! Of the erroneousness of this, however, they were sufficiently persuaded to resume operations again about the 15th. The main point of dispute was the amount of "extras" on vessels of over 5,000 tons.

They are now realising, however, that a loss on extras for work on boats of over 5,000 tons is abundantly compensated for otherwise. It is in the best interests of shipbuilding that the 7½ per cent. and the 5 per cent. should go, for boats are different now to what they were when the old list was framed. It is in the nature of things that they should be, and when the trouble is forgotten the men will be the first to admit this. The list, to begin with, should have had a fair trial, and it does not speak very highly for the organization in Scotland that in the very first fortnight it was denied even the semblance of a trial.

The number and importance of the launches from the Clyde yards during the past month constituted a fair average output, the principal item having been the Orient Liner *Omrah*, of 8,650 tons, sent off the stocks at Fairfield on the 3rd inst. In connection with this important launch, which was witnessed by thousands of spectators on both banks of the river, an awkward hitch occurred. When the vessel was almost off the ways she touched ground and the "way" on her was checked, with the result that the tide, which was strongly flowing, brought her forefoot back on the ways and there she stuck in spite of all efforts to get her off, until next tide, when she was safely floated, none the worse for her experience.

Another mishap of the same kind, but somewhat more serious, took place two days later in connection with the launch of the steamer *Italiana*, of 3,000 tons, from the yards of Messrs. R. Duncan & Co., Port Glasgow. When well advanced down the ways the vessel canted to one side, with the result that, in spite of all efforts to tow her off, she remained fast. The vessel had to lie in her collapsed position for more than a week until new launching ways were prepared under her, after which she was safely got into deep water and was towed to Glasgow to receive her machinery, which has been made in the works of Hall-Brown, Buttery & Co., of Govan.

The Clydebank Shipbuilding Co. during the month completed the large twin-screw steamer, *Moskva*, of the Russian Volunteer Fleet, which was launched from their stocks on May 23rd last, and after having been tried for speed on the measured mile and undergone a lengthened trial of her steaming powers, was handed over to her owner's representatives. The vessel, which has as many as three exceptionally lofty funnels and a cutwater stem, was a striking object on the Firth of Clyde while her speed trials were in progress. Her length overall is 508 ft., and between perpendiculars 470 ft., beam 58 ft. 3 in., depth 37 ft., and gross tonnage 7,400. She has accommodation for 74 first-class and 50 third-class passengers, and 1,536 emigrants or troops in time of war. While she can be easily converted into a powerful auxiliary cruiser, having a speed of about 20 knots, the *Moskva* is primarily intended to maintain a regular service between Odessa in the Black Sea and Vladivostock in Siberia. She is propelled by two sets of triple-expansion engines, taking steam from 30 water-tube boilers of the Belleville type. As the result of the company's experience with this type of boiler on board the *Kherson*, a similar twin-screw steamer built on the Tyne some years ago, the engine and boiler room staff is being increased, and will consist of 22 engineers, 38 stokers, and 27 helpers, or a total of 87 men. The Russian Volunteer Fleet are about to order two additional steamers of the same type as the *Moskva*, and it is highly probable one, if not both, will be entrusted to Clyde builders. The Russian Minister of Marine is also about to order two steamers to be used as transports between Vladivostock and the two ports of Port Arthur and Talienwan.

Messrs. A. McMillan & Son, Limited, of Dumbarton, who have at present, in hand and to begin, approaching 20,000 tons of new shipping, concluded negotiations about mid-month with a Continental firm of owners for the construction of a steel steamer of between 3,000 and 4,000 tons. The firm not being themselves engineers, are sub-contracting for the machinery with another firm.

Messrs. Muir & Houston, Limited, engineers and boilermakers, of Kinning Park, Glasgow, are supplying, for a twin-screw passenger steamer now under construction on the Clyde, a water-tube boiler of Thoms' patent design, an example of which has been at work in the premises of the firm named for several years. Several steam yachts have also already been fitted with this type of boiler, and its introduction into a passenger-carrying steamer affords further testimony to the more encouraging reception which proposals to adopt the water-tube boiler are meeting with at the hands of the Board of Trade.

The new shipbuilding firm at Greenock, Messrs. Taylor & Mitchell, having now got a good start with ship construction, have during the past month commenced ship repairing as well, having docked for this purpose the Clyde Shipping Co.'s tug, *Flying Mist*, and the Glen Line steamer, *Ardmore*, in West India and Garvel Graving Dock respectively.

Messrs. Scott & Co., Greenock, who have built the engines and boilers for H.M.S. *Canopus*, recently launched from Government stocks, submitted early in the month the Bellville boilers for this vessel, of which there are twenty, to official tests. This was done in their engineering establishment in presence of Admiralty officials and of others interested in this type of boiler. The steam pressure and coal consumption tests were of a thorough kind, and highly satisfactory results were obtained.

The James Watt Dock, Greenock, since its opening in 1886, has never been busier than it was last month. Shipbrokers, stevedores, timber-measurers, and harbour master had their hands pretty full in dealing with the heavy volume of traffic. As an evidence of the volume of shipping traffic it may be stated that the labourers' wages bill for a single week of one of the stevedoring firms amounted to over £300.

The Ferries Committee of the Clyde Navigation Trust have decided to order the construction of a new vehicular steam ferry with movable high-level platform of the same type as has proved so successful at Finnieston in Glasgow Harbour. The new ferry, which is to be capable of carrying one-half more vehicles than the first one, is to be stationed at Finnieston, and the existing one is to be removed to Govan, where there is at present a vehicular ferry, but not of the high-level type. The builders and patentees of this class of ferry—which was quite unique at the time of its introduction eight years ago, and which was fully illustrated and described in our columns on October, 1890—are Messrs. Wm. Simons & Co., of Renfrew, who will in all likelihood be commissioned to build the new and enlarged vessel.

For their magnificent new graving dock the Clyde Trust are having built, at the works of Messrs. Russell & Co., Motherwell, a powerful travelling crane with a jib sufficient to give an outreach of 74 ft., and capable of working a load at this radius of 25 tons. The width of the dock at cope is 115 ft., so that the outreach will be more than sufficient to deal with lifts along the centre of the dock.

Messrs. James Howden & Co., of Scotland Street, Glasgow, who for some years past have devoted themselves entirely to the production of apparatus connected with the system of forced draught, devised and patented by Mr. Howden, and for which there has been an ever-increasing demand in naval and mercantile steamers, have laid down entirely new works in Scotland Street, not far from the old premises, which are now about to be converted into stablings, &c., for the Scottish Co-operative Society. The new works are of much larger extent even than the old, and are constructed and laid out on the latest and most approved principles, Sir William Aroll & Co. having supplied and erected the structural iron work, including roofing, &c. The various shops are all equipped with the newest machinery, both of home and American make. Scarcely any of the firm's former tools or appliances have been reinstalled, partly because of their heavy nature for the class of work the firm now confine themselves to. All the previous machine tools have been disposed of privately to firms engaged in marine engineering and boiler making; a fact of interest in this connection being that a large portion of the tools have found their way to works in Germany.

Although Messrs. Howden & Co.'s new works have not long been in operation, it has already been found necessary to greatly enlarge the premises as originally schemed out and completed, and this work of extension is now about finished. The contracts on hand are very numerous and important, the H.P. represented being double what was under way at this time last year. Altogether the firm have produced and have on hand to date installations of their apparatus for forced draught represented by the prodigious figure of 2,250,000 I.H.P. This is exclusive of the supplies required in America, where on the Great Lakes, and also on the seaboard, the Howden system has taken a firm hold. The rights of manufacture in the States are now by purchase vested in the Detroit Dry Dock Co., for the lakes, and the Union Iron Works Co., San Francisco, for vessels built on and trading from the seaboard.

The light at the Cumbrae Lighthouse is to be altered from a fixed oil light to a flashing electric light, the electric plant for which purpose will be supplied by Messrs. Walter Dixon & Co., St. Vincent Street, Glasgow. This firm, who are the pioneers of the multiphase system in this country, have on hand, besides a large number of contracts for general lighting and power supply, several contracts of a noteworthy description. One is an installation of electric welding plant in the works of the Springfield Steel Foundry Co., London Road, Glasgow, who are availing themselves of the electric system of welding to obviate several of the well-known risks connected with the soundness of work in steel founding. It is worthy of note that the same generating plant employed for welding purposes will be utilised for lighting purposes as well. Messrs. Dixon & Co. are also engaged in electric installations for power and lighting in the Lugar and Eglinton Iron Works of Messrs. Baird & Co., whose Gartsherrie works were last year equipped by the firm, and has since given satisfaction. Another power installation which the firm has just set agoing is that at the Soda Works at Fleetwood of the United Alkali Co., where motors are employed driving centrifugal pumps, dryers, separators, &c., representing an aggregate of about 200 H.P.

Messrs. James Eadie & Sons, of Clydesdale Tube Works, near Rutherglen, the well-known manufacturers of iron and steel tubes are making considerable alterations in their works. Another combination of firms in the tube-making line, which may be considered as a sort of set-off to the recent Stewart & Clydesdale and Menzies & Co. amalgamation, is spoken of in Clyde industrial circles. This is a combination of Messrs. John Wilson & Sons, Govan, and the Union Tube Works, Coatbridge. It is stated that the capital of the combined concerns will be £170,000, half of which will be in five per cent. preferred shares, and half in ordinary shares. The profits earned are believed to be sufficient to pay the preference dividend and leave a margin sufficient to pay ten per cent. on ordinary shares.

Mr. Samuel J. P. Thearle, one of the senior ship surveyors to Lloyd's Register of Shipping, whose early training was obtained in the Government dockyards, and who for the past sixteen years has been on the Glasgow staff of the Register, has been appointed to the principal surveyorship in the Tyne district. Mr. Thearle is the author of several leading text-books dealing with "Naval Architecture, Theoretical and Practical," which, with the books of plates by which the text is copiously illustrated, have long been the standard text-books in technical schools, and especially in the classes held throughout the kingdom under the auspices of the Science and Art Department, South Kensington. Apart from these works, Mr. Thearle's pen has been largely employed in the cause of promoting a sound fundamental knowledge of both the science and practice of shipbuilding amongst students and others. In the summer of 1893 he was one of a deputation of leading surveyors sent by Lloyd's Register to the United States to acquire information on the spot, and report regarding the technical and commercial aspects of shipbuilding on the seaboard and on the Great Lakes, and to pave the way for the increased influence of the Registry in America. During the whole period of his connection with the Clyde, his unvarying courtesy, cheerful personality, as well as his high professional attainments, have earned for him the warm respect of the entire shipbuilding community. Mr. Thearle will leave the Clyde district for his new sphere of usefulness in the course of a week or two.

Messrs. S. & H. Morton & Co., of Leith, have contracted to reconstruct and lengthen amidships the powerful dredger, *Walter Bibby*, which some six months ago got aground and broke in two while engaged in the work of deepening the channel of the Water of Leith. The dredger was owned by a London firm of contractors, who were executing the deepening of the Channel for the Leith Dock Commissioners, and the work has, since the event, been postponed.

At Grangemouth, on the Forth, the Dockyard Co., who on the 1st ult. launched the steamer *Muriel*, of 3,000 tons deadweight capacity, specially adapted for grain carrying, have booked an order for a similar steamer from Messrs. Furness, Withy & Co., West Hartlepool, being the fourth vessel the company have built for this firm. These steamers are constructed on the strong sectional frame principle enabling all obstructions to stowage, in the shape of hold beams and deep web frames and stringers to be largely dispensed with. The vessel will be engined by Messrs. Hutson & Son, of Kelvinhaugh, Glasgow. The Dockyard Co. have at present four vessels on the stocks, and when these are completed the company will have turned out 200 vessels. Since the alterations to their dry dock a larger class of vessels are now availing themselves of the facilities for overhaul and repair.

The wet dock accommodation at Grangemouth being found inadequate by the Caledonian Railway Co. for satisfactorily dealing with the rapidly growing traffic in the eastern section of their system, it has been resolved to increase it by an amount equal to treble its present extent. The existing dock, locks, and timber basins have their entrance from the river Carron, at the junction of which with the Forth Grangemouth is situated. The Carron thus forms the means of communication between the docks and the deep waters of the Forth. Great difficulty has been experienced in keeping the river channel of sufficient depth for vessels of the draught now frequenting the port, as well as many of the vessels built by the Grangemouth Dockyard Co. These considerations have led Sir John Barry to advise the construction of a new dock on the ground lying to the north-east of the existing dock, and the formation of a new channel leading directly into the Forth. The distance between the old dock and the designed entrance from the Forth is about 1¼ miles, and included in this area, besides the new dock, there will be two channels; one connecting the dock with the Forth, and the other connecting the new with the old docks. Halfway between the Forth and the entrance lock into the new dock the channel will expand to form a large canting basin. The water area of the new dock will be about 33 acres, and will, as has been said, afford at least treble the accommodation of the present dock. Messrs. Charles Brand & Son, who were the contractors for the existing dock, will also be responsible for the new works, which are expected to be completed in about four years' time.

At Dundee the briskness in shipbuilding which prevails has had no parallel for many years, if indeed, it has ever been equalled in the history of the industry at this port. Several important contracts have been booked during the month, including an order for a vessel which will rank as the largest ever produced by Dundee builders. This has been secured by the Caledon Shipbuilding Co., and represents a steamer 425 ft. in length, 50 ft. beam, and 31 ft. 6 in. deep, the displacement of the vessel when loaded to her marks being as much as between 12,000 and 13,000 tons. She is to be fitted with very powerful engines, as well as all the latest requirements, and accommodation is to be provided for from 20 to 24 first-class passengers. The steamer, which is for a well-known firm of London and Liverpool shipowners, is to be engaged in the general cargo trade, though more especially in the carrying of loose cattle. At Caledon Yard there are at present on hand the last of four steamers for Messrs. Thomas Wilson, Sons & Co., Hull; one for Messrs. Leyland & Co., Liverpool; two for the Clyde Shipping Co.; one for the Dublin Steam Packet Co.; one for Russian owners for the Caspian Sea oil trade; and one for the Dublin Glasgow Steamship Co., Limited (Duke Line).

The Dundee Shipbuilders' Co., Limited, early in the month launched a coasting steamer which they have built to the order of a London firm, and about the same time they booked an order from Brasilian owners for two steamers of about 170 ft. in length, to be engaged in the carrying of loose cattle in Brazil, and there is a prospect of orders for two other steamers coming to the Tay at no distant date.

Messrs. Gourlay Brothers & Co. have on the stocks two steamers for the Finska Steamship Co., Helsingfors, and one for Messrs. Huddart, Parker & Co., Melbourne, and have just tried for speed and handed over the steamer *Coburg*, for Messrs. James Currie & Co., Leith. The firm is also in treaty for the building of a steamer for the Canadian Government. This vessel is intended to maintain winter service between Prince Edward Island and the mainland, instead of the *Stanley*, which is inadequate for the work. She will be 225 ft. long and extraordinarily strong, in order to make her way through the heavy icefields that block the Northumberland Straits.

Dundee Harbour has had its working facilities enhanced during the month by the handing over to the Trustees of the steam tug *Gilroy*, which has been built by Messrs. J. P. Renoldson, of the Tyne, and it is expected that the new dredger, which the trustees ordered from Messrs. Priestman, of Hull, will be delivered in the course of a few days. A satisfactory trial of the dredger has been made at Hull.

At Aberdeen the Works Committee of the Harbour Board have adopted the proposal and plans of their harbour engineer, Mr. R. G. Nicol, in consultation with Mr. H. H. Wake, for a reconstructed dock on the site of the present dock, which has long been considered inefficient and in an unsatisfactory condition. The estimate for the entire reconstruction of the dock is £125,462, including the following principal items:—Entrance, £17,722 14s.; main body of dock, £43,509; caisson berths, £6,795 11s.; caisson rest and dock end, £4,202 10s.; cofferdam, £4,320; new gates and machines, £4,250; caisson entrance, £9,251. The reconstructed dock will be 615 ft. long. The Board have also decided to provide a pontoon dock on the south side of the Albert Basin, which is to cost £7,000.

Messrs. John Duthie, Sons & Co., Aberdeen, who amongst other work have lately had six steam trawlers on hand for the Southern Steam Trawling Co., Waterford, Ireland, launched the fifth of the batch on 17th ult. The vessel is 111 ft. long and of 183 gross tons.

Conditional on the guarantee fund of £40,000 being subscribed before Sept. 30th, it was resolved at the end of August to hold an International Fisheries Exhibition at Aberdeen from June 1st to Sept. 30th next year. The fund as at 25th ult. amounted to £35,000, and there is every likelihood of the full figure being reached by the date assigned.

The Aberdeen undertaking is to comprise an international exhibition of sea and inland fishings, and products therefrom, life-saving appliances, coast illumination, and matters pertaining thereto; other local industries will also be represented. Useful literature and statistics and reports from foreign Consuls are also to be collected for the benefit of those industries. A deputation in connection with the proposed exhibition visited Bergen some time ago, and studied the Fisheries Exhibition organised there. The space enclosed in the Bergen Exhibition was 35 acres, and it was counted a great credit to a town of 60,000 inhabitants like Bergen. Aberdeen has a population of 140,000 and with another 140,000 in the surrounding country and its excellent railway connections north and south, it is in a much better position to secure success even than Bergen. Efforts are being made to obtain for the Aberdeen Exhibition the admirable collection at Bergen sent from the United States. With the Paris Exhibition in 1900 and the Glasgow Exhibition in 1901, Aberdeen may have chances to secure exhibits ultimately intended for these more pretentious undertakings. Aberdeen has not attempted an exhibition before, and the trade of the city generally will, it is hoped, be largely benefited by the Exhibition.

THE TYNE.

(From our own Correspondent.)

Shipbuilding.—This month there appears to be a falling off in the number of inquiries for cargo boats, and only a limited number of orders for vessels of this class have been placed. High wages and high prices for materials have conjointly helped to stiffen the prices of tonnage, and there are many who think that these prices have now reached the highest point. Under this conviction they will doubtless withhold their orders till the desired turning point (in prices) is within hail. The looked-for change, however, may be further off than is imagined, and it is by no means impossible for further enhancement to take place. At this moment the floating tonnage of the world seems to be pretty fully utilised in fairly remunerative work, in proof of which statement the fact may be cited that there is not a single vessel laid up in the Tyne; a state of things which has probably not been paralleled within the past two decades. The conveyance of grain from countries which have an over-supply as the result of this year's harvesting, to countries that have the misfortune to be in a different position as regards food stuffs, will very shortly take up an immense amount of tonnage, and for a time, at all events, the supply will probably fall short of the demand. Prices of tonnage are then almost sure to go up a further stage, so that it might prove the wisest policy on the part of owners who contemplate adding to their fleets to order promptly, no matter how long they may have to wait for delivery. For vessels of a special class inquiries still continue numerous, and there is reason to believe that several orders of importance have been placed at different centres on the North-East Coast during the month.

Messrs. Armstrong, Whitworth & Co. have been pressing on the attention of the Tyne Commissioners the necessity for a new graving dock on the Tyne, larger than any now in existence, and capable of accommodating the largest battleships, cruisers, and ocean-going passenger liners. It is urged that the dock should have an entrance 85 ft. wide, with a length of from 600 to 700 ft. and 28 ft. depth of water at ordinary spring tides.

The Elswick firm are willing to guarantee £5,000 per annum for the use of the dock, when they require it, with the right of having a first or preferential claim on it, should the Commissioners decide upon carrying out the work. There is hardly any room to doubt that the representations of the great firm mentioned will have sufficient weight to induce the Commissioners to undertake at the earliest moment possible the excavation of a new dock, of the dimensions required, and it is tolerably certain that if the Commissioners themselves were to show a disposition to procrastinate, public opinion would soon supply the necessary stimulus. The largest graving dock at present on the Tyne is that belonging to the Wallsend Pontoons Co., which is 550 ft. long, the Wallsend Slipway Co.'s dock coming next, and Messrs. Hawthorn, Leslie & Co.'s making the third largest, the lengths of the latter two being 540 ft. and 450 ft. respectively. There are slipways on the river, however, that are 1,000 ft. long, and pontoons that are capable of accommodating vessels of the very largest class.

The Palmer's Co., whose annual meeting was held on the 20th inst., have been making changes and improvements in the equipment of their shipyard and other departments, which are likely to have an important effect—economically speaking—upon the future of the great works, and of Jarrow. Among the changes made was the putting down of an electrical transmission installation, by means of which most of the punching, shearing, and other machines are rendered, in a manner, self-contained, and steam pipes to convey steam from the main boilers, are practically dispensed with. The electrically-driven machines being unaffected by the work put upon other machines, run at a uniform speed, which is found an immense advantage as compared with the old arrangement, under which slackening of speed—sometimes amounting to almost total stoppage—was a frequent occurrence. With a view to further facilitate the equipment and fitting out of steamers, the erection of new and much more powerful shear-legs than those now in use has been decided on. These are now in course of manufacture, and will doubtless be ready for placing in position by the end of the year. The company have also carried out improvements at the blast furnaces and in the steel works, the output of the latter department being now two and a-half times as much as it was six years ago.

At the Elswick yard a condition of great activity exists, there being, in addition to a large battleship, several powerful cruisers on the stocks. There are also a number of vessels being fitted out in the river, while in the preparatory departments sufficient briskness is noticeable to give abundant promise of further work to follow. The company's Low Walker yard is also exceedingly busy, the principal contracts in this case being for the construction of passenger and cargo boats of a large class.

At Messrs. Dobson's yard all the berths are occupied, one or two of the vessels in hand being of exceptionally large size; and at Messrs. Wood & Skinner's establishment there continues to be a full supply of work.

The United Steamship Co., of Copenhagen, have ordered two steamers of about 3,000 tons carrying capacity, from Messrs. Robert Stephenson & Co., who will also supply the engines. The latter, which will be of the ordinary triple-expansion type, will be constructed at the company's South Street Works, Newcastle. At the shipyard there are already on the stocks two large locally-ordered steamers, besides a quantity of pontoon work. The floating coal wharf built by the firm for Messrs. Cory & Son was delivered some time ago, and is, it is understood, now being put in readiness for the work of coal storing, lading, and unlading, for which it was designed. Messrs. Hawthorn, Leslie & Co. have several meat-carrying steamers in hand, and a rumour is current that a foreign order of importance has recently been secured. The building berths are fully occupied at present, and for some weeks past the graving dock has not been unoccupied.

Messrs. C. S. Swan & Hunter are making preparations for the laying down of the large Cunard liner referred to in last month's Notes, and are making excellent progress with other important contracts that are in hand. At the yard of Messrs. Wigham Richardson & Co., the preparatory work in connection with the building of the North-German Lloyd's large boat, has been commenced, and the fitting out of a couple of handsome steamers is being completed beside the yard.

The Northumberland Shipbuilding Co. have put down another vessel, and have received an order from a Norwegian firm, for a 6,300 ton boat, the machinery for which will be supplied by Messrs. Thos. Richardson & Sons, Hartlepool. This vessel is to be built to the highest class at Lloyd's and in the Norwegian Veritas, and will have an exceptionally large cubic capacity. Delivery is to be made by the spring of next year. At the Tyne Shipbuilding Co.'s yard the usual briskness continues to be noticeable, and at Messrs. Readhead's establishment there are four very large steamers on the stocks, and one in the graving dock undergoing repairs. The firm are also completing the equipment of a large vessel in the river. A steamer named the *Septiembra* is undergoing a rather extensive overhaul on the large pontoon of the Smith's Dock Co.

Engineering.—There is little that is new to report in connection with the engineering trade, excepting that Messrs. Hawthorn, Leslie & Co. have been commissioned by the Admiralty to supply the machinery for one of the warships building in the Government dockyard. Night shifts are continued at all the larger works, while at the smaller establishments overtime is largely worked. The ordnance and general engineering departments at the Elswick Works are kept in very active operation, while at the various electrical engineering works the briskness formerly reported is fully maintained.

The Combination Metallic Packing Co., Limited, of Lombard Street, Newcastle, continue to be well supplied with orders for their speciality, which is admirably adapted to meet the requirements of the high-speed engines, now so much in vogue. The company have orders in hand in connection with the machinery equipment of several high-class merchant steamers and battleships.

The month of August has almost proved a record month for the boiler covering operations of Mr. W. F. Snowdon, of No. 2 Side, Newcastle. In the period mentioned the contracts that passed through his hands numbered thirteen, among which we may particularize the ice-breaker *Sampo*, which had six boilers to be covered, besides an immense area of steam piping; the Chilian transport *Angamas*, which was also an exceptionally big affair; and the oil ship *Heliotus*, the boilers of which have been specially designed for the burning of liquid fuel. Mr. Snowdon has now an important contract to cover the steampipes of the Cunard liner *Ultonia*, and has also in hand the fine new steamer *Winifred* (built and engined at Hartlepool) and the s.s. *Septiembra*, which is being repaired on Smith's pontoon. The patent removable mattresses that have been introduced by this firm have turned out a great success, and have given the fullest satisfaction in all cases where they have been used. Among the vessels recently covered with these mattresses are the *Iona*, of Sunderland, and the *Kenmore*, belonging to Messrs. Cairns, Young, & Noble, of Newcastle. The results in these cases will, we have no doubt, be no less satisfactory than in the vessels previously fitted.

Blyth.—In spite of the fact that orders for cargo boats are rather more difficult to obtain than was the case a few weeks ago, the Blyth Shipbuilding Co., Limited, have, we understand, secured an order for two vessels of about 3,000 tons carrying capacity each, from a firm of London owners. The engines will be constructed by Messrs. Maccoll & Pollock, of the Wreath Quay Engine Works, Sunderland, and will be designed to propel the vessel at a good rate of speed. Delivery is expected to take place in the early part of next year. The ship-repairing accommodation at this port being of a very superior kind, it is not surprising that a good many contracts find their way to the enterprising firms who have provided the accommodation, and there is usually a fair supply of repair work in hand. At the coal shipping staithes business is also very brisk, increased shipments, as compared with corresponding periods of former years, being still the noticeable feature.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—The announcement that Messrs. Doxford had booked an order from the Peninsular and Oriental Co., and that the vessel was to be of the "turret" design, caused no small amount of satisfaction in this district; for it was felt that the incident was bound to raise the prestige of the port. This is only the third vessel ordered from builders on the North-East Coast by the famous P. & O. Co., the other two having been turned out by Messrs. Palmer, on the Tyne, some twelve months ago. The order is therefore the first from that source for the Wear, and it is but echoing the general wish when we say "it is to be hoped it will not be the last." The incident will, undoubtedly, bring the "turret" design into greater prominence than ever, and will be likely to further stimulate the demand for this type of vessel. The firm have just now on the stocks a vessel 420 ft. long, for the Johnson Line, Liverpool; and have other vessels of large size in progress and in preparation.

Messrs. Short Brothers are, as usual, very busy, and the same may be said with regard to Messrs. Pickersgill and Messrs. Priestman. The latter firm are about to launch a patent "self-trimmer" steamer, which has been built to the order of Messrs. Rood, McNair & Co. of Glasgow.

At Sir James Laing's yards great briskness continues to exist, and though a locally-owned vessel was launched a short time since, leaving one berth vacant, no vacancies are now to be seen, the keel for a steamer having been put down immediately after the dèbris of the launch was cleared. The three berths at Messrs. Robert Thomson & Sons' yard, are fully occupied, and an appearance of exceptional activity is noticeable in all the departments.

Messrs. J. L. Thompson & Sons have five vessels of a large class on the stocks, and two getting their equipments completed, at the Manors Quay Repairing Works. The electrical transmission installation at the latter establishment is, we understand, now in full operation, and the results achieved so far are highly satisfactory.

Messrs. Blumer & Co., have launched a fine vessel for Newcastle owners, and have placed the keel for another in the vacated berth.

At the Strand Shipbuilding Co.'s yard another order has been booked, and an important repair contract is expected to be secured. The Sunderland Shipbuilding Co.'s yard continues to be briskly employed, and at Messrs. Bartram & Son's establishment the two building berths are occupied.

Messrs. Austin & Sons have just launched a steamer for Messrs. Harrison, of London, which makes the twelfth turned out by them for the same owners. The circumstance is without doubt something to be proud of, and affords gratifying evidence of the good business relations existing, and the satisfactory manner in which contracts have been completed.

Engineering.—The whole of the engine works continue busy; but it is to be naturally expected that the pressure of work at Messrs. Doxford's establishment will be considerably increased by the addition of the contract to construct the engines, &c., for the P. & O. boat about to be built by the firm.

Messrs. Wilcox Bros. are receiving numerous orders for their specially designed propellers, which, in all cases where they have been fitted, have given the utmost satisfaction. The Mindel evaporator, which has been patented by the firm and recently put upon the market, is also being freely ordered.

Messrs. Maccoll and Pollock have obtained the order to build two sets of triple-expansion engines for vessels building at Blyth. These, we believe, will be the largest engines as yet undertaken by the firm, who are steadily extending their machinery power with a view to engaging in larger operations. In the smaller engineering works business continues good, and foundries are fully employed. Ironworks are also kept briskly going, and though chain making is an extinct industry at this port, the anchor manufacture still flourishes. At least this may be said in reference to Byers' patent stockless anchors, for which there is a very strong and ever increasing demand.

The Hartlepools.—The death of Sir William Gray, following so closely on that of Mr. Thomas Mudd, must be regarded as a calamitous event for the Hartlepools. Both men in their different spheres were men of mark, and in the locality where they were so well known both were equally popular. Of Sir William it may be said that he was the great bulwark of trade in the centre where he lived, and it is well that he lived long enough to make the position of the port—from an industrial point of view—practically impregnable. At the time of his death the shipyards and engine works under the control of this captain of industry were in the full tide of prosperity, and have every appearance of continuing so for a long time to come. At the docks business is just now very brisk, timber imports being plentiful. The coal shipping staithes are also kept busy, and at the Hartlepool Steel Works the state of business is exceptionally good.

Stockton.—The activity in local shipyards is maintained, there being no empty berths in evidence, and night work being still the rule in some departments of the business. The marine engineering and boiler making trades are also very active, and in the bridge yards and foundries work is still abundant. All the steel works are well provided with orders, and manufacturers are exceedingly loth to enter into new contracts, excepting on terms of far advanced dates for delivery.

Middlesbrough.—The shipyards at this centre continue to maintain an appearance of full activity, repair work contributing largely to the general volume of trade. It is stated that Messrs. Craggs & Sons have booked an order for four steamers of 300 tons each, and one of 1,000 tons capacity, to be delivered in the first half of next year. Engineering works are very busy, and both boiler and bridge yards are well employed. Foundries also are busy, and at the steel rolling mills an exceptionally large output is maintained. Business at the docks is, owing to heavy timber importations, much busier than at an earlier period of the year.

THE MERSEY.

(*From our own Correspondent.*)

EXCEPT that activity in all branches of marine engineering and shipbuilding is not only fully maintained, but if anything goes on increasing, there is no real change to report in the position generally during the past month. The pressure of work is necessitating, as previously reported, continual extensions of engineering establishments throughout the district, and the question is not one of securing new orders to replace those running out, but of complying with deliveries of orders already on the books, and of undertaking new work that can be completed within anything like the period required by customers. The difficulty in this direction is in many cases so great, that not a few orders which could otherwise have been accepted are allowed to pass, because firms are already fully engaged so far ahead, that they would be quite unable to deliver until well into next year.

Amongst the extensions of works in progress, one which is of special interest is that of Messrs. Joseph Adamson & Co., of Hyde, where electricity as a motive power is being adopted throughout on a very complete scale. At these works the power-generating station is close to the boiler-house, and contains hydraulic pumping engines, air compressors, and electric generators, and until quite recently the whole of the power required in the works has been developed in this house. Owing, however, to extensive alterations of the works, and the addition of more machinery, an increase in the electric power plant has become necessary. In this connection it is interesting to know that while no appreciable saving in coal followed the installation of the electric power plant about four years ago, owing to the continued increase in machinery, the difference is very marked now that the firm have had to go back partially to the old-fashioned mode of driving, *i.e.*, they are now quite sure that electric power in their shop, besides other advantages, means a saving in coal. The firm have also erected a large new boiler smithy, where they are introducing important improvements in the arrangement of the plant. The boiler shop proper is well supplied with electric overhead cranes of the three-motor type, and several of the machines in the works are driven by individual motors, especially the larger ones, while the firm have also motors driving lengths of shafting. The old boiler smithy, it may be added, is at present under reconstruction, and this together with an adjoining new bay already supplied with smaller tools, will be devoted more particularly to the construction of electric cranes, of which Messrs. Adamson have already made a considerable number, and have nearly a score at present on hand, several of which are for shipyard requirements.

The usual monthly returns issued by the principal engineering trade unions fully confirm the above remarks as to the state of trade, the present activity making itself felt in a reduced unemployed list. The Amalgamated Society of Engineers has now only 2¾ per cent. of its total membership on out-of-work benefit, as compared with over 3 per cent. last month. In the Manchester district, however, the proportion of unemployed members continues above the average for the society generally, there being still 4 per cent. of the local membership on benefit, which is a rather high figure considering the state of trade in the locality, and is partially attributed by the society officials to "the excessive amount of overtime which is now being worked." The Steam Engine Makers Society is in an exceptionally satisfactory position, the number on donation in this union being only ¾ per cent. of the membership, whilst in the Manchester district practically a "clear book," as regards members on out-of-work benefit, is reported. The United Machine Workers' Association has now only 3¾ per cent. on this benefit, whilst in the Manchester branches not more than 1⅓ per cent. are receiving support. The returns received from various districts as to the state of trade continue of a most favourable character. The majority of the branches report trade as "good," and the remainder generally "moderate," with actual slackness reported only in isolated cases, Birmingham being the most important of these. The activity in trade has enabled the workmen in several districts to obtain improved conditions, and at Belfast, Hull, Kilmarnock, Dumbarton, and Dowlais, advances in wages have been secured.

Messrs. Thomas Blears & Co., of Hulme, Manchester are introducing an improved combined milling, boring, and facing machine, for which a number of special features are claimed. This machine, whilst possessing all the advantages of a universal milling tool, is also adapted for boring and facing work of every description and is provided with a boring bar and cutter, and also with a facing head, which will face up to 18 in. diameter, whilst the machine has also a variable and instantly reversible automatic feed motion. The main spindle, which is supported in phosphor bronze bearings, with suitable adjustments, is bored through the whole of its length to receive another spindle, which is turned to fit, and free to slide within the main spindle, upon a feather key, and a screw and phosphor-bronze nut at its rear end is suitably geared for an automatic feed. The front end of this spindle has a thread cut upon it to receive boring heads, or chucks for twist-drills or milling-cutter mandrils, to support the outer end of mandrils when milling, or boring bars during boring. The screwed bar is mounted in suitable bearings on the main headstock, upon which is carried a pendant or tailstock in alignment with the main spindle, and which is traversible in either direction with a sliding spindle having a thread cut upon it for two-thirds of its length, and is connected or disconnected with the train of wheels working the other feed motions, or may be moved in either direction by hand, as desired. The machine has a wide range of speeds and feeds suitable for all kinds of work. The feed movements of the compound table are reversible and can be operated in either direction instantly. The circular table can be revolved and is self-setting in four positions. The box portion of the main bed of the machine is fitted with a door, and may be used as a tool cupboard.

Messrs. Stanley, Davies, & Pollard, of Hyde, near Manchester, are introducing a very compact electrical plant which will be found specially suitable for ship-lighting installations, where economy of space is of necessity an important requisite. This new plant consists of a non-condensing steam dynamo-engine, and a dynamo of the inverted type, with plain ring armature, combined on one bed, or it can be supplied with the firm's "Standard" type of machine, with slotted drum armature, and it is claimed there is no sparking, whilst the rise in temperature does not exceed 60 degrees Fahr. The engine is of the "Sentinel" simple type, fitted with automatic expansion governor, and self-oiling throughout, with very efficient governing, and it is so designed as to be economical in the consumption of steam, whilst it runs without noise or vibration. The plant is made in various sizes, from 5 electric h.p., with 100lb. steam, up to 35 h.p., and capable of supplying from 50 to 390 sixteen-candle lamps. It may be added that one of the firm's large plants has just been ordered by the New South Wales Government, and considerable numbers of their smaller sizes are also being sent out.

An exceedingly strong tone is maintained throughout the iron trade of this district. During the month business has been coming forward more freely, and prices have shown a further hardening. In pig iron some large transactions have been put through, and in most brands makers, who are generally well sold, have substantially advanced their list quotations. With regard to local brands forge qualities remain at 47s. 6d., but for foundry makers are now asking 50s. 6d. less 2½ delivered Manchester. Lincolnshire makers have further advanced their quotation 6d. per ton, the basis rates being now 45s. for forge and 47s. 6d. for foundry, net cash, delivered Manchester. Derbyshire foundry is without quotable alteration, but exceedingly firm at 50s. to 51s. net cash, delivered Manchester. Middlesbrough iron is also about 6d. higher, 51s. 7d. to 51s. 10d. being now quoted for good named foundry qualities, net cash, delivered by rail Manchester. Scotch iron has hardened up considerably, 52s. 3d. for Eglinton, and 51s. 9d. for Glengarnock, net cash, representing the average quotations for delivery Manchester Docks. Quotations for American pig iron are scarcely more than nominal, sellers as a rule having little or nothing to offer. Considerable arrivals are, however, expected from the United States during the ensuing month.

In the finished iron trade bars have been in brisk request, and although there has been no further official advance on list rates for Lancashire qualities, makers are so well booked that they are in many cases declining new orders at current quotations, which are £6 to £6 2s. 6d., delivered here, whilst for North Staffordshire bars the minimum has been raised to £6 5s. per ton. Sheets are only in slow demand at about £7 to £7 2s. 6d., but hoops have been moving away fairly well, one Lancashire works having booked large orders for India, and prices are well maintained at the association list rates of £6 10s. for random to £6 15s. for special cut lengths, delivered Manchester district, and 2s. 6d. less for shipment.

Exceptional activity prevails throughout the steel trade, and makers and manufacturers are in many cases so well booked, that they are unable to entertain new orders for anything like early delivery. Prices maintain an exceedingly strong tone, and generally show a further advance on last month's rates. Hematites have been put up 6d. per ton, No. 3 foundry qualities being now quoted 62s. 6d. to 63s. 6d. less 2½; local billets, £4 11s. 3d. net; bars now range from £6 10s. up to £6 15s. and £6 17s. 6d.; common steel plates £6 15s., with steel boiler plates now quoted £7s. 7s. 6d. to £7 10s. delivered in this district.

The metal market continues brisk, all descriptions of manufactured goods for general and marine engineering requirements being in active demand, and prices firm at full list rates, although there has been no official advance. Delivered Manchester distinct brazed brass tubes average 8½d., common rolled brass 6¼d., common brass wire 6½d., copper wire 7½d. per lb.

Business in the timber trade has been unsatisfactory. Imports have been in excess of requirements, and sales consequently difficult to effect. Stocks are ample in all cases, and in some instances excessive. A large quantity of the import has gone direct to the Manchester Ship Canal, owing to the improved facilities provided there for landing, and dealing with the steamer cargoes at present so extensively used in the wood trade. The accommodation provided in Liverpool by the Mersey Docks and Harbour Board is quite inadequate, and considering the rapid discharge, the time allowed for removing goods from the quay is totally insufficient, and in trade circles the opinion is held that the recent action of the Dock Board in the treatment of the timber trade must have the effect of driving still more of the trade to Manchester. The import of teak logs and plants has been moderate, and the demand quiet, but there is more enquiry for forward delivery, and prices are steady. No import of greenheart is reported, but the consumption has been very small, and the stock is ample.

In the coal trade here, there has been somewhat of a slackening off as regards the weight of business doing. During the earlier part of the month collieries were kept fully engaged owing to the accumulation of orders placed just prior to the advance in prices; but this has now been worked off, and although collieries are still on full time the output is not in all cases moving away. The market has also been rather unsettled, owing to the advance in prices having only been partially followed in other districts, but generally Lancashire collieries are holding pretty firmly to their list quotations. The tapering off in the demand has been chiefly in house-fire qualities, but for these prices are steady at about 11s. to 11s. 6d. for best Wigan Arley; 10s. to 10s. 6d. for seconds Arley; 9s. to 9s. 6d. for Pemberton four-foot; 8s. to 8s. 6d. for common house coal. Steam and forge coals are in good request, with no surplus of supplies of any moment, and prices well maintained at 7s. 6d. to 8s. at the pit mouth. Engine fuel moves off fairly well, although the position varies at different collieries. Generally an advance on August rates is being got throughout Lancashire, and common slack averages 3s. 6d. to 3s. 9d.; medium, 4s. 3d. to 4s. 6d.; and best sorts, 4s. 9d. to 5s. 3d. at the pit mouth.

In the shipping trade a tolerably active demand comes forward, but since the settlement of the South Wales dispute, the volume of business doing has shown a considerable reduction and prices are easier. In special cases 10s. might still be got for steam coal delivered Mersey ports, but the average quotation is now about 9s. 6d. per ton.

Mr. Rushmore, of Jersey City, N.J., makes a dynamo of a novel kind for yacht lighting in connection with storage batteries. It works on the new multivoltage system and charges the cells a light load by carrying the lights on one pair of brushes at 110 volts and the battery to the other pair at a voltage of 160 volts or over. At full load the dynamo works in parallel with the battery. The machine can thus charge the battery in the night run, and does not require to do so in the day time like other machines.

THAMES.

(*From our own Correspondent.*)

MESSRS. MAUDSLAY, SONS & FIELD have on hand at present engines of 18,000 I.H.P. with 24 boilers of the Belleville type for H.M.S. first-class cruiser, *Spartiate*, which is now building at Pembroke Dockyard; and engines and boilers of 13,500 I.H.P. for H.M. first-class battleship *Albion*, which is now being fitted in the Victoria Dock by the Thames Ironworks Co. They have also just commenced the engines and boilers for H.M. first-class battleships *Irresistible* and *Venerable*, building now at Chatham. Belleville feed pumps, furnace air pumps, electric light engines, air compressors, and other auxiliary machinery are being constructed for battleships and cruisers being built by other firms. Belleville boilers have been supplied for H.M.S. *Vindictive*, which has just recently completed a very satisfactory series of trials, and the Belleville boiler work in hand at present includes 18 boilers for the Austrian cruiser, *Kam D*, and 16 boilers for each of the coast defence vessels at present building for the fleet of the same country. There are also four boilers for a Chilian training ship building on the Tyne.

Repairs on the Thames are very well in hand. The Glengall Iron Works, which is mostly full of boiler and engine repairs, has got them well through. The dry dock, which takes in a large-sized vessel, is ready for new work.

Fletcher, Sons & Fearnall, which when full employs 800 men, is preparing for more and larger work than they have done hitherto. They have been used to two dry docks, but they have had in hand and will soon have finished a new dry dock larger than the other two, in which they will be able to accommodate vessels of very large size.

Messrs. Yarrow & Co., of Poplar, are still busy. With their Japanese order on the stocks, more orders have come in, and these have simply to wait until room can be made for them in the yard and in the shops. It is not so very long ago since this yard only sent out small launches. Soon, however, the excellence of the work brought orders for torpedo-boats and torpedo-boat destroyers, and now the yards are always full of this type of craft. The shops are so full of machine tools that when one goes into them they have hardly room to turn; indeed, every foot of space is occupied. This has led the firm to look about for more extensive accommodation, and negotiations are in progress to obtain another yard some little distance higher up the Thames than the present one. Should the negotiations prove successful the new premises will allow the firm to increase the output to a large extent.

Messrs. Caird & Rayner were never so full of orders as they are at present. The floor of the fitting shop is completely covered and the order book contains orders which will keep the firm fully employed for a long time to come. They have just completed a compound set of evaporators for H.M.S. *Albion*, and these are now undergoing the shop tests preceding those of the Admiralty. Another set of evaporators has been constructed for the Castle Line, and is now fitted up and ready for the shop tests. These tests are made with steam generated in Babcock and Wilcox boilers. Though no reducing valve is used the steam is wonderfully dry, and suits the testing operations well. With one evaporator in which the Admiralty allowed 1·25 gallons of steam to evaporate and produce one gallon of pure water, the evaporator only required 1·15 gallons. To obtain this from so small a quantity of steam required very dry steam from the Babcock and Wilcox boilers, as well as a highly efficient evaporator. In the case of a compound evaporator the result was still better. In this case the Admiralty allowance of ·75 gallons of steam to produce one gallon of pure water was done with much less. Only ·68 gallons of steam from the boilers were required to produce one gallon of pure water. The results given above were not selected. The test book was simply taken and the leaves turned until a single evaporator was reached in the first instance and a compound evaporator in the second. Some trials will shortly be made with a live steam feed water heater made by this firm, which will be of some interest.

Drawings were shown of a novel kind of surface air condenser, which has been in use for several years in Australia and produced excellent results. This firm has made several evaporator sets for the colony, and the main object was to save water as much as possible. The condenser is formed of sheets of corrugated iron held separate at the ends with strips of lead. The air is drawn through one pair of strips and the steam goes through the next pair. The heat of the steam flows through the strip of iron, and the air flowing at the other side carries it away, getting itself heated as it does so. The heated air could be utilised for any purpose. Professor Watkinson has applied the apparatus to heat the air of combustion before it goes into the furnace, but instead of using steam for this purpose he uses the hot gases flowing in the uptake. In his case hot gases are on the one side of the corrugated plate getting cooled while cold air is flowing from the atmosphere to the furnace on the other side of the plate getting heated.

The trials of the Blechynden boilers on board the *Pactolus* are still proceeding under the management of John Penn & Sons, Greenwich. There was a slight mishap to one of the tubes, but that was soon put right and the trials are proceeding.

The *Sheldrake* will soon be ready for its trial. This time the Admiralty have fitted in the Babcock and Wilcox boilers, and the trials are looked forward to with some interest. Some days ago another of the Wilson line was on her trials. She was fitted with two Babcock and Wilcox boilers, and she steamed 13·8 knots 1,564 average I.H.P. The consumption of North Country coal was only 1·48 per I.H.P. during the trial. The total heating surface is 5,500 square feet, and the number of square feet of heating surface per I.H.P. was 3·8, which is a very liberal allowance. The consumption of coal was 18 lbs. per square foot of grate.

The comparative proximity of sea water to London during this summer calls to mind the paper recently prepared by Dr. Routh on the subject of having distilled water to supplement the present inadequate supply. The sea and river water could be utilised and evaporated for this purpose, but it would be at considerable cost. One pound of coal would evaporate roughly 10 lbs. or a gallon of water, and at this rate one ton would evaporate 2,240 gallons. In Southampton the water is sold at sixpence per thousand gallons, and so the cost there for 2,240 gallons would be one shilling and three halfpence. One could hardly buy one ton of coal for that amount, so it would appear that obtaining water by evaporation would be too costly.

It appears, however, to us, that sea water could be brought to London in mains, being pumped hither, and that it could be used for flushing drains and for watering the streets. We might even suggest the luxury of a salt water bath being available to the householder, tempered by an addition of hot water from present sources.

It is evident and imperative that immediate measures must be taken by the authorities to place London and other cities beyond the reach of a water famine, and the water of the sea may assist in the solution of the problem.

Messrs. Yarrow & Co. are getting ready a stern wheel vessel for Buenos Ayres. The wheel is not large, and it has powerful engines on each side. The diameters of the cylinders are 20 inches. The wheel has ten floats and dips 18 inches into the water. The engines are of course at the stern, moving the wheel by means of cranks, and to keep the keel as even as possible the boilers are in front of the cabin. She is said to have steamed eight knots against the tide, but the makers want more out of her.

The six coaling barges which are being fitted with chain hoppers for coaling vessels are nearly completed and have been tried, giving considerable satisfaction. These barges are built of iron with compartments. There is a division up the middle for the hoppers. The buckets are made of plates joined together so that they will keep in coal at the sides and bottom. The division between one bucket and another is a plate at right angles to the back. The whole buckets chain and all the movable parts are carried at the sides on an angle iron platform. The arrangement is driven by an engine of about 20 I.H.P. in the stern. This engine is also geared to work twin propellers, which moves the barge from place to place at an easy speed. The coal is let down into the middle space above the buckets through bunker doors, and stirrers are placed down through the coal near these doors to make the coal move where it is likely to stop going through the doors. The doors are lifted by means of a screw and the quantity of coal allowed to get through into the buckets regulated. The buckets rise at the bow up an inclined elevator which can hang over the ship's side, and so allow the buckets as they reach the top and turn round and back to drop the coal into a shoot going down into the ship's hold or bunkers. The barges carry about 300 tons of coal.

BELFAST.

(*From our own Correspondent.*)

THE Belfast ironmoulders have gone out on strike, in consequence of the employers refusing to accede to a demand for an increase of wages of 1s. Messrs. Harland & Wolff, who are not members of the Federation, had previously given the advance, the other employers stating that the Queen's Island firm are in a different position from the other foundries, being very busy, whilst the rest are employing fewer moulders now than a few months ago. In accordance with the demand made by the Amalgamated Society of Engineers, the engineers in the employment of Messrs. Harland & Wolff have received an advance of 1s. per week in their wages. Messrs. Workman, Clark & Co., Limited, have also received a similar demand, but so far it has not been granted; it is expected they will give the concession before long. These firms being outside the Masters' Federation the request was made personally to them, but a demand for the advance, it is said, has also been forwarded to the Masters' Federation.

The Irish Lights Commissioners have, it is stated, definitely arranged to erect a light on the Chaine Memorial Tower, on the north side of the entrance to Larne Harbour. The apparatus for this improvement was designed some time ago, and was approved of by Trinity House. It is said to be now nearly complete, and will be in working order before the winter sets properly in. Red and white lights will be used, and they will be so arranged that whenever the light is white the vessel will be in safety; if she deviates to the north no light will be visible, and if she deviates to the south a red light will be visible. In order that this light on the Chaine Memorial Tower may not be confused with either the Maiden's Lights or the lighthouse light at entrance of Larne Harbour, it will be made an occulting light, and once completed, cannot but prove a valuable guide to mariners making Larne Harbour.

The vessels of the Port Squadron are expected to arrive in Belfast Lough on 29th inst., leaving again on October 4th, they will be moored most likely at Carrick Roads.

The building of the *Shamrock* is to be commenced at once by Messrs. Harland & Wolff. The first race with the American boat will take place on the 5th October, 1899.

Messrs. Harland & Wolff during the month launched the twin-screw steamer *Manhattan*, the first of the large new vessels under construction for the National Steamship Co., Limited, trading between London and New York.

NORTH-WEST OF ENGLA

(*From our own Correspondent.*)

Barrow-in-Furness.—The chief item of news this month in the local shipbuilding world is the securing of an order by Vickers, Sons & Maxim, of the Naval Construction Works, Barrow, from the Japanese Government for the building of one of the largest and most effective battleships ever designed. It is said that the price to be paid for this ship complete, with all her munitions of war, is about £930,000, but this figure is inside the mark. The cost, with guns, &c., will probably reach a million and a quarter. She will exceed anything yet built in size and in offensive and defensive qualities, and the most remarkable fact is that she will be completed and armed by the Vickers' company without outside help. When Mr. James Dunn, late Assistant Director of Naval Construction, joined the board of Vickers', a new department was opened at the company's offices, Victoria Street, Westminster. Here the new Japanese battleship has been designed. Her displacement exceeds 15,000 tons. She will be provided with a deep belt of armour from ram to stern. Her equipment will include four of Vickers' 12-in. 50-ton guns, which attain a muzzle energy of 44,573 feet-tons, and will have another large installation of other quick-firing guns, each shot developing over 5,000 foot-tons energy. The twin-screw engines will be of the triple expansion type, and will develop 15,000 I.H.P. Apart from the fact that the Japanese Government have been spending their Chinese indemnity money in the building of the most formidable type of battleships ever launched, it is an interesting feature in the history of modern shipbuilding that a firm like Vickers, Sons & Maxim should have undertaken in their several departments at Sheffield, Barrow, Erith, and elsewhere to building complete from their own resources entirely the greatest monsters of battleships the world has ever known. This will probably mean that much of the work required, at any rate by foreign navies, will centre itself at Barrow, and especially so having regard to the fact that all the work hitherto turned out of the Barrow yard has given unbounded satisfaction. Up to now no work, however, has been done at Barrow for foreign governments. The latter, of course, are naturally slow to entrust orders in this country with firms that have not had great experience. Barrow has now won that experience, and as Messrs. Vickers can not only build ships at their own yard, and utilise their own make of armour-plates, which have won positions of the highest merit when the most crucial tests have been applied, but can provide them with their own highly successful heavy guns made at Sheffield, and quick-firing guns made at their Maxim works at Erith, together with a complete outfit of ammunition, &c., made at their general works in England and on the Continent. It is known that Vickers' guns have taken a first rank position by reason of the many new and important patents introduced by Lieut. Dawson and others. This department of Vickers' great concern is undoubtedly up to date, and there is no want of enterprise in any other departments to bring them up to a high standard of perfection. This is a fact that is being especially shown at the Barrow Works, where great extensions are being made on every hand. The works at present cover more area than any similar establishment in the world, but this is already found too small, and within a short time it may be expected that many additions will be required in order to enable the company to establish new departments incidental to the realization of their determination to do all the work themselves required for the complete outfit and equipment of ships of all sorts. At present the company is building another bay to its already large engineering shop in order to embrace the requisite machinery for the making of gun-carriages and mountings. In this regard it is interesting to note that the company has not only obtained the order for building the gun-carriages and mountings required by H.M.S *Vengeance*, building at Barrow, but for other ships in which their guns are being supplied. During the month the company received the order for gun-carriages and mountings for H.M. battleship *Venerable*, building at Chatham. These are very important orders and denote the success Vickers have achieved as well in guns as in gun mountings. There is already very great activity in the gun-carriage department, and this is likely to increase. There will evidently be a further necessity to increase the capacity of the engineering department by reason of the great amount of work in hand, and also because now that Belleville boilers are being so largely used in battleships there is no end of engineering work in connection with them, which takes up a deal of time on machines that are also wanted for other work. There is the satisfaction about any prospective enlargement of Vickers' work at Barrow that plenty of land is available not only on the Barrow side of Waling Channel, but on Waling Island itself. The new addition to the engine works at Barrow will employ 1,000 additional workmen, and other enlargements in progress may safely be put down for another 500 men. At present between 6,000 and 7,000 men are employed, and it is believed by those most in the know that before many years are over this number will have increased to over 10,000 men. There is at present a great demand for house property in Barrow, and although new property is being erected in many parts of the town, the speed at which it is being done is not commensurate with the demand that exists, and very far in arrear of the exigencies of a prospective demand that is more than assured. The attention of capitalists who have money to dispose of which they want to lay out remuneratively will doubtless be called to this great and immediate want in Barrow. There is also the further fact to take into consideration that, as Vicker's great firm expands its area in Barrow and begins to augment the rate at which new tonnage is launched and indicated engine horse power built, greater activity will centre itself in the local steel trade and a fuller demand arises on its resources. Thus increased house accommodation will be needed on this issue alone. It is very easy to see how under its new regime Barrow is gradually assuming a more settled, more steady, and a more stable, commercial, and industrial existence. That is attracting greater confidence to the place, and it is quite on the cards that subsidiary industries will come into existence to support the bigger ones and thus help to make the economy of the place all the more successful and satisfactory. Further than this, the ups and downs of the shipbuilding trade in Barrow in the past have been so marked that many workmen kept their wives and families elsewhere so as to avoid the necessity of selling up their household furniture and removing bag and baggage to another town. There were hundreds of carpet-baggers in Barrow, and in fact are to-day, but the quantity is growing less, workmen feel they can with safety make Barrow their home, and this is so much the fact that it is noteworthy at property sales held in the town that workmen are ready to pay the high prices ruling for property without a murmur. Much progress is being made in the construction of H.M. battleship *Vengeance*. It was said sometime ago that she would be completed in the record time, and it is evident from the celerity with which increased weight is being daily added to the ship, that this promise will be realised. In all probability the *Vengeance* will be launched this year, as her ways are required for another ship. The Clan Line steamer *Clan Cumming* will be launched on October 1st, and the ways on which she has been built will probably be used to lay down the new armoured cruiser *Euryalus* for the British Admiralty. The *Clan Cumming* is a turret steamer of 7,000 tons, and a sister ship is being built alongside for the same line. She will be launched before the end of the year. Two West Indian Pacific steamers of 6,000 tons are well in frame, and the keel has been laid of the new Pacific Steam Navigation Co.'s steamer of 7,000 tons. The first-class armoured cruiser *Hogue* has had her keel built up and progress will soon commence with her framing. The telegraph cable ship *Anglia* is now ready for sea. After her trial she will at once proceed to the Thames, where she will receive her tanks to carry the cables and other fittings for the special trade she is to be engaged in. She is a fine big ship of about 11,000 tons displacement, and is so constructed that when not required for the purpose of laying telegraph cables, she can be utilised as a cargo boat. She is the largest ship ever built for this purpose. Great activity is observable in the engineering shops of the Naval Construction Works, and two sets of men night and day are working. The leeway has not yet been made up which was occasioned by the strike, because new work has been poured in so quickly, but the output of engines gauged by I.H.P. is very considerable at present, and when the new extensions have been made to the works a still greater capacity of production will be the result. There is one satisfaction, and that is that there is no scarcity of work nor is there likely to be. The protected cruiser *Amphitrite* is now receiving her engines and internal fittings in the Devonshire Dock. Her masts have already been stepped. Her Belleville boilers, 30 in number, are all ready for being placed in her hold, and her engines are just receiving their finishing stroke in the shops, so that early next year this cruiser will be ready for her trials. By that time the *Vengeance* will be ready for her engines and general fittings. Since the engineers' strike the relations between masters and men have been of a very satisfactory character. Several concessions have been freely given to the men in almost every trade, and it is probable that any reasonable demand would be fairly considered by the employers, seeing they are so busy, and desire to avoid any conflict with the men; because, although they won on the last occasion, it meant in the long run a very great pecuniary loss both to masters and to men. There is some talk about a disagreement between the masters and the men in the shipbuilding department, but from present appearances this is not likely to be the fact in Barrow. On Wednesday, the 21st of September, Mr. John McGregor, second in command at the Naval Construction Works engineering shops, died suddenly. He was at work up to late on Tuesday night, and was then taken ill and died within a few hours. He came to Barrow from Fairfield with the late Mr. Bryce Douglas, and was recognised not only as a very capable engineer but as a good organiser, and as having a pleasant way in dealing with men.

West Cumberland.—The rumour is revived that the old Whitehaven Shipbuilding Yard is likely to be resuscitated. Some time ago the yard with the old machinery it contained was bought at auction by Lord Lonsdale, with the view of its being utilised some day in the promotion of the town's industries. Doubtless the yard would soon be reopened if local capitalists would combine under some good practical directors who know the shipbuilding business. At Workington and Maryport the shipbuilders are fairly but not briskly employed.

Shipbuilding Material.—There is a very brisk inquiry for shipbuilding material of all descriptions, and makers find their capacity of production unequal to the calls made upon them. Both the heavy and the light rail mills are very fully employed night and day, and makers hold orders very fully in advance.

The demand has recently shown considerable expansion, and if the makers in the district could increase their output they could find plenty of orders to keep them going, and prospects show that there is every probability of the present active state of things being maintained for a long time. Several classes of shipbuilding material are likely to be made at the West Cumberland Steel Works, which has lately been taken over by the North Western Hematite Steel Co., Limited. Plates are firmer and higher in price, heavy descriptions being at £6 3s. 9d. per ton, while angles are at £5 18s. 9d.

The Hematite Trade.—A fuller demand than ever has arisen for hematite pig iron, and there is a veritable famine, as the output is restricted to the make of 41 furnaces, owing to the scarcity of native ore. Stocks have been depleted to the extent of 56,683 tons since the beginning of the year, and now stand at 127,767 tons. Prices have advanced, mixed Bessemer now being at 55s. per ton nett free on board, while warrant iron is at 54s. 6½d. net cash sellers, 54s. 6d. buyers.

Shipping—There is much activity in the shipping trade of the West Coast. Exports of pig iron this year have reached 375,615 tons, and of steel 396,461 tons, as compared with 315,928 tons of pig iron and 333,933 tons of steel in the corresponding period of last year, showing an increase of 59,687 tons of pig iron and 62,528 tons of steel.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from July 4th to August 1st, 1898.

14772 A. D. Wedgwood. Rudders.
14797 J. C. Chapman (M. V. B. Howe, United States). Rotary steam engines.
14837 R. A. Douglas. Watertight manhole covers.
14842 F. J. Fox. Attaching leeboards to boats.
14844 A. Almack. Ships' berths for houses.
14863 B. Seabrook. Composition for coating ships' bottoms.
14872 I. Wittenberg. Preventing vibrations of engines.
14875 A. W. Montgomery Moore. Actuating bulkhead doors.
14902 L. T. B. Sanderson. Cables.
14926 H. B. Barlow (The Jennings Pump Proprietary, Limited, Victoria). Centrifugal pump.
14963 E. Gearing. Heating water and generating steam.
14968 F. E. and F. H. Hofmann. Mechanical stokers.
14975 F. Swanzy, W. Cleaver, and H. Thame. Buoyancy apparatus.
15045 C. V. Burton. The balancing of engines.
15059 E. Laurent. Boilers.
15060 E. H. Stanfield and F. R. Martin. Chucks.
15067 J. E. Liardet. Steering gear.
15099 S. W. Wilkinson. Valves of steam engines.
15125 W. H. Greatorex. Sight feed lubricators.
15136 A. Tomlin and F. Bent. Cleansing boilers.
15170 W. J. Calder. Rotary engines.
15171 W. J. Calder. Paddle blades.
15174 J. L. Featherstone. Connections for valves.
15180 J. R. Rickard. Friction gearing for boats.
15189 C. Ott and L. Meyer. Stuffing-box packings.
15191 A. S. Bower. Protecting iron and steel.
15200 N. Chandler. Steam engine valve gear.
15219 J. Wagner. Mechanical stokers.
15232 Z. Maevsky. Valve gear.
15252 T. Gardner. Ball float valves.
15275 H. Foster. Internal combustion engines.
15281 E. E. Edwards. (K. Weisberger, Austria.) Propelling ships.
15293 J. Plenty. Sectional water-heaters.
15313 C. A. Allison. (L. A. Lang and E. F. Walsh, United States.) Valve gears.
15333 S. T. Wilson and W. W. Branch. Rotary engine.
15351 W. H. Harfield. Anchor gear.
15360 A. MacLaine. Ships of war.
15378 C. Binks. Torpedoes.
15418 G. W. Bennum and C. R. Jones. Boats.
15420 J. Harris. Securing hatch sheets on vessels.
15441 J. Taylor. Utilising the waste heat from steam boilers.
15462 J. R. Wigham. Buoys.
15485 J. Sheldon. Propelling ships.
15522 T. Ansboro and J. Fairie. Watertight doors.
15546 C. H. Laverick. Shields for gauges of boilers.
15555 E. Edwards. (P. Michelson, Russia.) Tubes for steam boilers.
15615 W. J. Hewitt and A. E. Dearden. Utilising the rise and fall of tidal waters.
15618 W. Snowden. Governors for steam engines.
15634 W. Dougherty. Filtering feedwater.
15643 C and R. Paulitschky. Submarine tunnels.
15649 D. G. Lewis. Life buoys.
15671 W. Stanley. Rotary steam engine.
15693 F. W. Golby. (C. C. Vermeer, Holland.) Carrying cargoes.
15732 H. H. Lake. (K. Spanier Germany.) Controlling supply of feedwater.
15735 A. C. Darmer. Protecting the hull of vessels.
15784 H. H. Lake. (H. J. Barron United States). Regenerating exhaust steam.
15788 R Schulz. Water-tube boilers.
15791 J. F. Flannery. Supply fuel to boilers.
15816 J. Stirling. Lubricating bearings.
15884 F. C. Blake. Internal combustion engines.
15898 J. Butterworth. Pistons.
15919 J. H. Kendle. Funnel.
15922 A. Bland. Pistonrod packing.
15924 B. and G. Ermen. Flexible valve for pumps.
15937 M. F. M. Mulready. Steam engines.
15946 T. W. Good. Compass.
15956 T. H. Peverell, S. P. Bahnsen, and F. W. Mason. Trawling boards.
15959 V. A. Jensen. Lock-nuts.
15965 C. W. Thompson. Boat-propelling apparatus.
15975 O. Imray. (J. V. Hansen Uruguay.) Submarine vessels.
15992 A. H. Lessells. Indicating points of the compass
15997 H. R. Stockman. Suction of pump dredgers.
16004 J. C. Falconer and C. Berry. Towing ships.
16024 J. Ball. Shackle for ropes and chains.
16036 D. R. Ward. Stoking apparatus for furnaces.
16038 W. L. Bone. Safety valves.
16086 R. M. Day. Locking bolt nuts.
16121 W. S. Stallybrass and H. Copeland. Securing asbestos on boilers.
16127 W. Keen. Water-tube boilers.
16128 W. P. Bullivant. Torpedo nets.
16142 J. Warburton. Steam boilers.
16148 G. R. Palmer. Steering ships.
16169 H. F. Swan. Constructing navigable vessels.
16189 M. H. Simoriet. Constructing parts of ships.
16249 F. A. and F. H. Moreton. Connections for piston-rods.
16250 E. R. Standfield and W. Brabson. Screw propeller.
16285 G. F. Atwood. Steam engine indicators.
16294 E. Edwards. (F. Beil, Austria.) Utilising power of floats.
16300 R. F. C. Keats. Regulating the speed of engines.
16302 O. Morris, W. A. Keys, and C. T. Gamble. Slide valves for steam engines.
16306 F. Johnson. Mounting ships' galleys.
16318 E. J. Moore. Steam boilers.
16322 H. E. Newton. (C. C. Worthington, United States.) Pumping machines.
16327 R. Haddan. (W. C. Baker, United States.) Anti-friction bearings.
16330 M. H. C. and R. E. C. Shann. Steam generators.
16365 W. MacLeod. Screw propellers.
16382 J. C. Morrison. Tools for cutting boiler tubes.
16400 J. Hallett. Removing ashes from stokeholds.
16421 W. Muirhead. Manhole doors.
16432 J. Sharp. Pumps.
16497 A. H. Sansum and J. Inson. Oil burners for ships.
16514 R. Harrison. Lubricators.
16558 J. A. Balk. Propeller for ships and boats.
16574 C. Sterner. Steamships.
16582 H. Sidebottom. Water turbines.
16592 G. Hughes. (G. Lofgren, United States.) Wave-operated motors.
16596 A. Thomson. Gauge-glass fittings.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Florida.—On August 20th there was launched at Newcastle a steel schooner-rigged steamer of 4,163 tons gross, named the *Florida*, for the United Steamship Co.

Klondyke.—On August 20th Messrs. Cook, Welton & Gemmell launched at Hull the steam trawler *Klondyke*. Her dimensions are 105 ft. by 21 ft. by 11 ft.; her owners being the Hull Steam Fishing and Ice Co.

Strephon.—On August 24th there was launched at Hull an iron steam trawler of about 167 tons gross, named the *Strephon*, for the Standard Steam Fishing Co., Limited, Grimsby.

Gloriana.—On Wednesday, August 24th, Messrs. Short Bros. launched from their works at Pallion a handsomely modelled steel screw steamer, built to the order of Sir Christopher Furness for the British Maritime Trust, Limited, of London. Her principal dimensions are:—Length, 316 ft.; breadth, 42 ft., and depth, moulded, 26 ft. 9 in. The vessel is built of steel to the highest class in Lloyd's Register under special survey, and is constructed on the improved spar deck principle with single deck laid, having open beams on main deck, on which a deck may be laid at any time to suit the trade in which she may be engaged. The framing being on the improved deep frame principle leaves the holds clear of obstructions. The vessel is fitted with a cargo poop, long bridge amidships, on which is fitted up houses for the accommodation of captain and officers, with saloon and messrooms, etc. A commodious topgallant forecastle is fitted up for the accommodation of the crew. The holds are four in number with six powerful steam winches and a very large donkey boiler. Steam steering gear is fitted at the after end of the engine platform with controlling rods from flying bridge. The bottom is of the cellular construction divided into six compartments for water ballast, the after peak being also fitted up as a trimming tank. Every attention has been given in the arrangements of the vessel for the quick loading and discharging of cargoes and the appliances are of the latest pattern. On leaving the ways the vessel was named *Gloriana* by Miss Short, of Ashbrooke Hall. The vessel is fitted with triple-expansion engines by Messrs. John Dickinson & Sons, Limited, of Sunderland, having cylinders 23 in., 38 in., and 62 in. diameter, with a stroke of 42 in., steam being supplied by two large steel boilers.

Orono.—On Tuesday, August 30th, Sir Raylton Dixon & Co., Limited, launched from their Cleveland Dockyards, Middlesbro', a handsome screw steamer, 320 ft. by 44 ft. by 26 ft., built to the order of Messrs. Gellatly, Hankey & Co., of London, and intended for the River Plate trade. The vessel is of the spar deck type with poop, bridge and forecastle, classed 100 A1 at Lloyd's, and has a deadweight capacity of about 4,650 tons on a light draught of water. The accommodation for captain, officers, and engineers, is in houses on bridge deck, and crew in topgallant forecastle. The engines, by Messrs. T. Richardson & Sons, Limited, Hartlepool, are of the triple-expansion type, having cylinders 23 in., 36 in., 59 in. by 42 in. stroke, and supplied with steam by two large single ended-boilers working at 180 lbs. pressure and fitted with Howden's system of forced draught. On leaving the ways she was named *Orono* by Mrs. Kennedy, of Saltburn.

Peter Jebsen.—On August 30th there was launched from the yard of Messrs. John Readhead & Sons, West Docks, South Shields, a new screw steamer, built to the order of Messrs. Bergh & Holland, of Bergen. The vessel, which is 353 ft. in length over all, 46 ft. 6 in. broad, and 27 ft. 3½ in. depth, moulded, is of the improved single-deck type, and takes the highest class at Lloyd's and Norske Veritas. She has cellular double bottom fore and aft for water ballast, and is fitted with all modern improvements for the rapid loading and discharging of cargo, and is also strengthened forward for steaming through ice. The cabins are in poop aft, and there is accommodation under bridge for engineers, &c., crew being in topgallant forecastle. She has a deadweight carrying capacity of about 5,850 tons on a light draught. The steamer will be fitted with triple-expansion engines, also constructed by Messrs. John Readhead & Sons, having cylinders 24 in., 40 in. and 64 in. with 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. As the vessel left the ways she was named the *Peter Jebsen* by Miss Clementson, of North Shields. This is the fifth vessel built for the above owners by Messrs. John Readhead & Sons.

Archibald Hood.—On August 31st there was launched at Falmouth an iron steam tug of about 164 tons gross, named the *Archibald Hood*, for the Barry Railway Co., Barry.

Wilhelmina.—On August 31st there was launched at Sunderland, from the shipbuilding yard of Sir James Laing, a liner for the Neptune Steam Navigation Co. The vessel, which has been built on the spar deck principle, is 350 ft. long, 46 ft. broad, and 29 ft. 3 in. deep. She is cellular bottomed throughout, and has been designed with a view to meet the requirements of the Rotterdam and Baltimore trade, in which she will be exclusively engaged. Accommodation for the captain and passengers has been made aft, that for the officers and engineers in the side houses under the bridge, while the crew have been berthed in the topgallant forecastle. Her gross tonnage is given as 3,000, net 2,300. She has four holds and seven winches, the latter being worked by steam from the donkey boiler. She will be fitted with triple-expansion engines by Messrs. Geo. Clark, having cylinders of 26 in., 43 in., and 71 in. diameter, with a stroke of 45 in. She is built of steel, and will be classed 100 A1 at Lloyd's. Upon leaving the ways she was named the *Wilhelmina*.

Muriel.—On September 1st the Grangemouth Dockyard Co launched at Grangemouth a steel screw steamer, designed to carry 3,000 tons deadweight, and fitted specially with a view to the carriage of grain. Dimensions are:—280 ft. by 40 ft. 6 in. by 20 ft. 6 in. She has been built to the highest class at Lloyd's, and is of the single deck type. The owners are Messrs. Orders & Handford, Newport (Mon.), who were represented at the launch by Mr. W. J. Orders. As she left the ways she was named *Muriel*, and the machinery will be supplied by Messrs. Hutson & Son, Glasgow.

Medjerda.—On Thursday, September 1st, Messrs. Wigham Richardson & Co. launched from their Neptune Shipyard a very finely modelled steamer, built to the order of the Compagnie de Navigation Mixte of Marseilles. This steamer, which was named the *Medjerda* by Miss Agnes le Mesurier, is the seventh steamer built by Messrs. Wigham Richardson & Co. for this company. She will run with mails and passengers on the Marseilles and Tunis line. The *Medjerda* is fitted with luxurious accommodation for first-class passengers amidships, comprising large, well-ventilated state-rooms, ladies' room, airy dining saloon on the spar deck and very comfortable smoking room above. There is also a fine promenade deck for these passengers, which will add much to their enjoyment. The second-class passengers are accommodated in the poop, and the rooms for their use have been carefully designed with the view of affording them the greatest amount of comfort. The third-class passengers are placed forward. The lighting and the bells throughout will be electric. The engines and boilers are of Messrs. Wigham Richardson & Co.'s own make and have been arranged to give a high rate of speed. The owners were represented at the launch by Mr. Matagrin, their superintendent engineer, under whose supervision the work of construction is being carried on.

Riplingham.—On Sept. 1st there was launched from the yard of Messrs. Robt. Thompson & Sons, Sunderland, a first class steel single-deck steamer, built for cargo trade. Her dimensions are:—Length between perpendiculars, 313 ft.; breadth, extreme, 44 ft. 2 in., and depth, moulded, 23 ft. 0½ in. She is built on the deep frame principle with one deck, thus leaving large holds clear of all obstructions of beams and stringers, and is classed 100 A1 at Lloyd's. She is owned by the East Yorkshire Steamship Co., Limited, Messrs. A. Meek & Sons, Goole, managers; and is a sister ship to their *Brantingham*, built by the same builders last year, and is designed to carry a large deadweight on a draught of 19 ft. 8 in. The vessel is fitted with a poop aft, bridge amidships, both for carrying cargo, and a topgallant forecastle. The captain and officers are accommodated in a large house on the top of the bridge at the fore end, and the engineers in two side houses under the bridge deck at the after end; the petty officers and crew have quarters in the forecastle. Ample water ballast is provided in the cellular bottom and in the after peak. Five hatches, each worked with a winch, with steam supplied from a large multitubular donkey boiler, will enable the vessel to be loaded and discharged very rapidly. She is schooner rigged, with two masts, and is supplied with four boats raised on high chocks. The engines are of the triple-expansion type, with cylinders 22 in., 36½ in. and 60 in. diameter, with a stroke of 42 in.; two steel boilers of 180 lbs. pressure, built by the North Eastern Marine Engineering Co., Limited. Both ship and engines have been designed with all the most modern improvements for a first-class cargo steamer. During construction the hull and machinery have been superintended by Mr. Jenkin, and captain Newlove. As the vessel left the ways she was gracefully christened *Riplingham* by Miss Florence Meek, sister of the managing owner.

Turkistan.—On Thursday, Sept. 1st, Messrs. Wm. Gray & Co., Limited, launched the large steel screw steamer *Turkistan*, which they have built for Messrs. Frank C. Strick & Co., Limited, of Swansea and London. Her principal dimensions are:—Length, over all, 362 ft.; breadth, extreme, 45 ft.: and depth, 26 ft. 8 in. She is a handsomely modelled vessel of the spar deck type, with poop bridge and forecastle, having very tasteful cabin accommodation under the poop for passengers, captain and officers, and fitted throughout with electric lighting. The vessel will take Lloyd's highest class, and has a cellular double bottom and after peak tank for water ballast. The steam windlass, steam steering gear, steam winches, marine type donkey boiler, and the whole of the outfit are of the most approved description. The machinery is made by the Central Marine Engine Works of Messrs. William Gray & Co., Limited, being of the triple-expansion type, with cylinders, 28 in., 43½ in., and 72 in. diameter, and a piston stroke of 48 in., and two large steel multitubular boilers working by forced draught at a pressure of 160 lbs. per square inch. The vessel and machinery have been constructed under the superintendence of Mr. Archibald Walker and Captain Rosser on behalf of the owners, and the ceremony of naming the *Turkistan* was gracefully performed by Mrs. Farmer, of Balderton Vicarage, Newark, Notts, daughter of Sir Wm. Gray.

Zingara.—On September 1st this vessel was successfully launched by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, and has been built to the order of Messrs. Turner, Brightman & Co., London, and is the fifth vessel built by this firm for these owners. The vessel is built to Lloyd's highest class on their three-deck rules, the principal dimensions being:—Length, between perpendiculars, 348 ft.; breadth, extreme, 48 ft. 3 in., and depth, moulded, 25 ft. 8 in. She has the usual poop, bridge, and forecastle, with the whole of the accommodation for saloon, officers, and engineers, spare berths, etc., on top of the bridge amidships, the bridge and poop being left clear for cargo. The vessel will have a large measurement capacity, and will carry her cargo on a light draught. She is fitted complete with all the latest improvements for the rapid handling of cargo, and with all the requirements for the South American trade. The propelling machinery is being constructed by Messrs. Blair & Co., Limited, of Stockton-on-Tees. The hull and engines have been constructed under the personal supervision of Mr. P. J. McCabe, the owners' superintendent. The launch was most successful, the vessel being gracefully christened and launched by hydraulic power by Miss Brightman, daughter of Mr. C. E. Brightman. There were also present at the launch Mr. C. E. Brightman, of London; Mr. George Turner, London; Mr. and Mrs. Gillett, London; Mrs. McAlpine, Blyth; Mr. Joseph L. Thompson, J.P.; Mr. and Miss Johnson, North Shields; Captain Briggs, of North Shields, and others. After the launch, the company adjourned to the firm's luncheon room, where the usual toasts were duly honoured.

Brighton.—On September 1st Messrs. Ropner & Son launched at Stockton a very fine steel screw steamer, 235 ft. long, built to the order of a Newcastle firm. Her machinery will be supplied by Messrs. Blair & Co., Limited. As she left the ways she received the name of *Brighton* from Miss Williams, daughter of the superintendent-captain.

Steel Screw Steamer.—On September 1st there was launched from the shipbuilding yard of Messrs. W. Harkess & Son, Middlesbrough, a steel screw steamer, built to the order of Messrs. Pile & Co., of London, of the following dimensions:—Length, 163 ft.; breadth, 26 ft.; depth, 13 ft.; to carry 700 tons on 12-in. draught of water. This vessel is schooner-rigged, and will be fitted with engines, 12 in., 21 in. and 33 in. cylinders, by 24-in. stroke, and large boiler working at 160 lb. pressure.

Morayshire.—On September 1st Messrs. R. & W. Hawthorn, Leslie & Co., Limited, launched at Hebburn-on-Tyne a steamer, 420 ft. by 54 ft. by 32 ft., built to the order of Messrs. Turnbull, Martin & Co., of London, for their Australian trade. The vessel is specially fitted for carrying frozen meat, with powerful duplicate refrigerating machinery. A large insulated space having a capacity of 230,000 cubic feet is provided in the holds forward of the machinery space, leaving all the after holds available for general cargo. The machinery consists of a set of triple-expansion engines capable of indicating upwards of 3,000 H.P., with three large single-ended steel boilers, working at a pressure of 160-lb. per square inch. On leaving the ways the vessel was named *Morayshire* by Mrs. Caird.

Caisson.—On Saturday morning, September 3rd, Messrs. Edward Finch & Co., Limited, successfully launched from their yard at Chepstow a large caisson, which they have built for the Bristol Docks Committee for their Avonmouth Dock. The caisson was designed by John M. McCurrich, Esq., Engineer-in-Chief to the Bristol Docks and approved by Sir John Wolff Barry and Mr. Brunel. Her principal dimensions are:—Length, 75 ft. 3 in.; breadth, 30 ft. 2 in.; depth, 44 ft. 6 in.; and the launching weight no less than 630 tons (hull 410 and ballast 220 tons). The hull is built of mild steel all of Lloyd's quality; there are five tiers of beams, two stringers, two watertight steel decks and a wood upper deck, three watertight transverse bulkheads, and two longitudinal watertight bulkheads, dividing her into 22 compartments, 18 being watertight: ten of these are used as water ballast tanks for sinking the caisson into her position at Avonmouth Dock entrance; these ten tanks have a capacity of 900 tons; the water is admitted through the side of the caisson by means of 16 in. diameter pipes, each compartment being controlled by a valve specially designed for the purpose; these valves are worked by hydraulic power, hand gear also being fitted to each. The caisson when being worked is raised by forcing out the water ballast through the 16 in. diameter pipes by means of air pressure acting upon its surface. A valve chamber is fitted on upper deck which contains the whole of the working valves, air cocks, indicators, pressure gauges, etc., bringing the whole operation of raising or lowering the caisson under the control of one man.

Longbenton.—On September 5th there was launched from the Blyth Shipbuilding Co.'s Shipyard and Repairing Works, at Blyth, a steel screw steamer for Messrs. T. & W. Smith, of Newcastle-on-Tyne, for their general coal trade. The steamer is 218 ft. in length, 30 ft. in breadth, and 16 ft. in depth, 100 A1 class, with raised quarterdeck, bridge and topgallant forecastle, and is generally adapted for the coal and general trades. The engines will be supplied by the North Eastern Marine Engineering Co., Limited, and are of the triple kind, with cylinders 17 in., 28 in., and 46 in., by 30 in. stroke. As the steamer left the ways she was christened the *Longbenton* by Miss Jennie Nixon, younger daughter of Mr. John Nixon, of Blyth. The hull of the vessel has been built under the inspection of Mr. Andrew Lynn, of Newcastle.

Roche Castle.—On September 5th there was launched at Hull an iron steam ketch of about 180 tons gross, named the *Roche Castle*, for the Castle Steam Trawlers, Limited, London.

Blanche.—On September 13th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel lighter of the following dimensions:—Length, over all, 71 ft.; beam, moulded, 19 ft. 8 in.; depth amidship, 8 ft. 6 in., and with a carrying capacity of 250 tons. The vessel was built to the order of Mr. John Scott, High Street, Hull, and under the superintendence of Mr. Townhill, consulting engineer; this is the sixth built for the above-named owner. As she left the ways she was christened *Blanche* by Mrs. Tom Scarr.

Peerless.—On Thursday afternoon, September 15th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions:—Length, over all, 336 ft.; breadth, extreme, 45 ft. 6 in.; depth, moulded, 26 ft. 4 in.; gross tonnage, about 3,100 tons. This vessel, which has been built for Messrs. Hall Brothers, of Newcastle-on-Tyne, will class 100 A1 in Lloyd's Register under special survey. She has been built to the three-deck rule with one deck laid, and has cargo poop, bridge, and topgallant forecastle. Captain and officers are berthed in a large house on bridge deck, engineers in after-end of bridge, and crew in topgallant forecastle. A cellular double-bottom throughout and after-peak tank are fitted for water ballast, and equipment includes 5 steam winches, large horizontal multitubular donkey boiler, steam windlass, stockless anchors, steam steering gear, &c. The engines, by Messrs. Blair & Co., have cylinders 23 in., 38 in., and 62½ in., with a stroke of 42 in., steam being supplied by two single-ended boilers, having a working pressure of 160 lbs. As the vessel left the ways she was christened *Peerless* by Mrs. J. A. Sharrock, of Holy Trinity Vicarage, Stockton. The vessel has been built under the supervision of Captain Lowrie, owners' superintendent.

Thirlby.—On September 15th Messrs. Ropner & Son launched at Stockton-on-Tees a steel screw steamer of the following dimensions, viz. :—Length, between perpendiculars, 275 ft.; breadth, extreme, 39 ft. 7 in.; depth, moulded, 18 ft., which they have built to the order of Messrs. R. Ropner & Co., West Hartlepool. The steamer is of the part awning decked type, having poop and raised quarterdeck. Her deadweight carrying capacity is 2,750 tons on 17 ft. The engines will work up to about 700 effective H.P., and are by Messrs. Blair & Co., Limited, having cylinders 19½ in., 32½ in., and 52½ in., with a 36 in. stroke, steam being supplied by two large steel boilers working at 160 lb. pressure. The name of the steamer is *Thirlby*.

Daghestan.—On September 15th there was launched from the Walker Shipyard of Sir W. G. Armstrong, Whitworth & Co., Limited, a large steel screw steamer built to the order of the La Societe Anonyme pour l'Importation des Huiles des Grassage, Antwerp, and intended for the carriage of petroleum in bulk. The principal dimensions of the vessel are:—Length, 315 ft.; breadth, extreme, 40 ft.; depth, 26 ft. The vessel has been built on Swan's system, and will be capable of carrying 3,700 tons deadweight. Messrs. Robert Stephenson & Co. will supply a set of triple-expansion engines, and the vessel was named *Daghestan*.

Harlech.—On September 15th Messrs. S. P. Austin & Son, Limited, launched at Sunderland the steel screw steamer *Harlech*, built to the order of Messrs. J. & C. Harrison, Limited, of London, Newcastle, Cardiff, &c.

Prudhoe Castle.—On September 17th there was launched from the Union Shipbuilding Co.'s yard, Blyth, a new wooden screw trawler, built to the order of Mr. Robert Irvin, jun., of North Shields. The dimensions of the vessel are:—Length, 91 ft.; breadth, 18 ft. 4 in.; and depth, 9 ft. 3 in. The vessel was named *Prudhoe Castle*, and will be engined by Messrs. Baird & Barnsley, North Shields.

Edison.—On September 17th Messrs. Cochrane & Cooper launched from their Grovehill shipyard, Beverley, a steam trawler of the following dimensions:—115 ft. 4 in. by 21 ft. by 11 ft. 6 in. depth of hold. The vessel, which is an addition to the fleet of Messrs. F. & T. Ross, Limited, Hull, will be complete with all the latest improvements in fishing gear, and will be supplied with triple-expansion engines by Messrs. Amos & Smith, Hull. The vessel was named the *Edison* by Mrs. C. E. Ross. After the ceremony the company adjourned to the offices of the builders, where lunch was provided. The usual toasts were duly honoured.

Everest.—On Saturday, September 17th, Messrs. Wm. Gray & Co., Limited, launched the fine steel screw steamer *Everest*, built to the order of Messrs. Murrell & Yeoman, of West Hartlepool. The vessel will take Lloyd's highest class, and her dimensions are:—Length, over all, 300 ft.; breadth, 42 ft., and depth, 21 ft. 9 in. The deck erections consist of a poop, bridge and forecastle. A handsome saloon and cabins for officers, &c., are fitted up aft, the engineers' rooms are in the bridge, and the crew's accommodation forward. The hull is built on the deep bulb angle frame system, with a cellular double-bottom, aft peak tank, four steam winches, steam-steering gear amidship, hand-screw gear aft, large donkey boiler, steam windlass, boats on beams overhead, grain divisions, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply first-class triple-expansion engines of 1,000 H.P., having cylinders 21½ in., 35 in., and 58 in. diameter, with a 39 in. piston stroke, and two large steel boilers to work at 160 lbs. pressure per square inch. The ceremony of naming the steamer *Everest* was gracefully performed by Miss Eva Murrell, Hartlepool.

Frances Holland.—On Monday, September 19th, Messrs. Wm. Pickersgill & Sons launched from their shipbuilding yard, Southwick, a fine steel screw cargo steamer of the single-decked type. The dimensions of the vessel are as follows:—Length, 295 ft.; breadth, 43 ft.; depth, moulded, 21 ft., and she has been built to Lloyd's highest class under special survey. The hull is built on the deep frame principle, and fitted throughout with water ballast in cellular double-bottom except under boilers. The after peak is also fitted for water ballast. The accommodation for captain and officers is fitted up in poop aft, together with a neat saloon tastefully finished in mahogany with teak pilasters, and decorated with inlaid panels. The engineers are comfortably berthed in side houses at the end of the bridge, and rooms for petty officers and crew are arranged forward in topgallant forecastle. The vessel will be rigged as a two-masted fore and aft schooner, having steel lower masts, and wood telescopic topmasts. She has been provided with four very large cargo hatches, four steam winches, and steam-steering gear by Rogers, steam windlass by Emerson, Walker & Thompson Bros., and donkey boiler by Riley Bros. She has been designed to carry about 3,600 tons deadweight on an extremely light draught, and will be completed throughout in a thoroughly efficient style with all the latest appliances necessary to the modern cargo steamer. The machinery and boilers are to be supplied by Messrs Geo. Clark, Limited, of Southwick, the engines being of the triple-expansion type, having cylinders 21 in. by 35 in. by 57½ in., with 39 in. stroke, and two large steel boilers, with a working pressure of 160 lbs. This steamer has been built to the order of Mr. F. S. Holland, of London, and during construction has been under the superintendence of Mr. W. C. Carter, consulting engineer to the owner. On leaving the ways she received the name *Frances Holland* at the hands of Mrs. F. S. Holland, the wife of the owner.

Windsor.—On September 21st Messrs. Cochrane & Cooper, Ltd., launched from their Grovehill Shipyard, Beverley, a new steam trawler of the following dimensions:—100 ft. by 21 ft. by 11 ft. depth of hold, for the Queen Steam Fishing Co., Ltd., Grimsby. The vessel will be supplied with triple-expansion engines, by Messrs. C. D. Holmes & Co., Hull, of 45 N.P., and she will be complete with all modern appliances for trawling. The vessel was named the *Windsor* by Mrs. G. H. Cross, and after the ceremony the company adjourned to the offices of the builders, where lunch was provided, the usual toasts being duly honoured.

Synd.—Lately the Blyth Shipbuilding Co, Limited, launched the *Synd*, a light draught steel screw steamer of the following dimensions:—297 ft. by 43 ft. by 21 ft. 3 in. The vessel is built to class 100 A1 at Lloyd's, and is of the single deck type, having deep framing but no hold beams.

Quixotic and Romantic.—Lately there was launched from the yard of Earl's Shipbuilding & Engineering Co., Limited, Hull, two new steam trawlers for the Grimsby Steam Fishing Co, Limited, for whom Messrs. Moodys & Kelly, of Grimsby, are the managers. These make respectively the ninth and tenth of a large batch of vessels ordered last year by this firm. The first of this pair was named the *Quixotic*, and the second the *Romantic*.

LAUNCHES.—SCOTCH.

Sir Edwin Markham.—On August 18th Messrs. Hawthorns & Co., Limited, launched at Leith the first of the two vessels which they are at present building to the order of H.M. Government. This vessel is intended for service in the Mediterranean, and will be fitted with triple-expansion engines of 500 H.P. As she left the ways she was named *Sir Edwin Markham*.

Raloo.—On August 18th there was launched from the yard of the Ailsa Shipbuilding Co., Troon, a steel screw steamer, built to the highest class at Lloyd's for Irish owners. The vessel is fitted with every modern convenience for the loading and discharging of cargo. The engines, which are triple-expansion, are being supplied by Messrs. Muir & Houston, of Glasgow. As she left the ways she was named *Raloo* by Miss Wallace, Ashgrove, Ayr.

N. G. Petersen.—On August 20th Messrs. Carmichael, Maclean & Co., Greenock, launched a single-deck screw steamer to the order of the Vendila Steamship Co, Copenhagen. The vessel, which has been designed to carry a deadweight of 2,150 tons on light draught, with accommodation in forecastle, bridge and poop, will be furnished with all modern appliances for the quick working of cargo, steam windlass, steam and hand-steering gear, and is fitted with large water ballast capacity. The vessel has been built with a view to adaptability for general trade, and special arrangements have been made for the convenient carrying of deck cargo when on the Baltic route. The dimensions of the vessel are:—239 ft. by 36 ft. by 19 ft. moulded, gross tonnage 1,400 tons. She has been constructed to the highest class at Lloyd's. Triple-expansion engines will be supplied by Messrs. Muir & Houston, Limited, Glasgow. The vessel was named the *N. G. Petersen* by Mrs. Ellekilde, wife of Captain Ellekilde, who represented the owners at the launch.

Falls of Keltie.—On August 23rd Messrs. Russell & Co. launched from Kingston Yard, Port-Glasgow, the steel screw steamer *Falls of Keltie* for Messrs. Wright, Graham & Co., Glasgow. The dimensions are:—Length, 330 ft.; breadth, 48 ft.; depth, 26 ft.; and the steamer will have a deadweight carrying capacity of 5,400 tons. Messrs. Kincaid & Co., Greenock, will supply triple-expansion engines.

Abbotsford.—On August 25th Messrs. Carmichael, Maclean & Co., Greenock, launched from their shipbuilding yard a steel screw steamer to the order of Messrs. Frew, of Glasgow, for their coasting trade. The dimensions of the vessel are:—1:0 ft. by 21 ft. 6 in. by 9 ft. 4 in., moulded, classed 100 A1 at Lloyd's, well-deck type. Triple-expansion engines will be supplied by Messrs. Walker, Henderson & Co., Glasgow. The ceremony of naming the vessel the *Abbotsford* was gracefully performed by Mrs. Andrew Balfour, Hillhead, Glasgow.

Cearense.—On August 25th there was launched from the shipbuilding yard of Messrs. Murdoch & Murray, at Port-Glasgow, a steel twin-screw steamer of 300 tons gross register, for passenger and cargo service on the River Amazon. The vessel, which was named *Cearense*, will be supplied with compound engines by Messrs. Lees, Anderson & Co., Glasgow.

Diligent.—On August 31st there was launched from the shipyard of Messrs. Barclay, Curle & Co., Limited, Whiteinch, a steel paddle tug, built to the order of the British Admiralty, and intended (like the *Dromedary*, also constructed by same builders for Her Majesty's Government) for the towing of battleships and general service. With this view she is furnished with towing gear of the strongest description. The vessel is fitted with commodious cabin, sleeping accommodation, &c., and has numerous watertight compartments. The dimensions are—144 ft. by 27 ft. 3 in. by 15 ft. 8 in., with a gross tonnage of 405. The vessel was named the *Diligent* by Miss Gracie Murdoch, Goole, and after the launch proceeded to the harbour to receive her engines, which are being constructed by the builders. The machinery consists of two sets of compound oscillating paddle engines, arranged with disconnecting gear, so that each wheel has a complete pair of engines attached to it for easy manœuvring in H.M. dockyard. Being intended to act as a fire vessel, she is fitted with two large double-cylinder pumping engines, capable of discharging large quantities of water, also with fresh water distilling machinery to enable her to go on foreign service. The high-pressure cylinders are 31 in. diameter, and the low pressure cylinders 55 in., all having a stroke of 5 ft. Steam is supplied by two large single-ended boilers, and the whole of the main and auxiliary machinery is fitted up in the usual Admiralty style.

Muriel.—On September 1st the Grangemouth Dockyard Co. launched from their shipbuilding yard at Grangemouth a handsomely-modelled steel screw steamer, designed to carry 3,000 tons deadweight on light draught, and fitted specially with a view to the carriage of grain. Dimensions are 280 ft. by 40 ft. 6 in. by 20 ft. 6 in. She has been built to the highest class at Lloyd's, and is of the single-deck type, with poop bridge and forecastle, four hatches and holds constructed on the strong frame principle, so as to have no obstruction, such as beam or web frames, and she is fitted with all the latest improvements for the rapid working of cargo. The owners are Messrs. Orders & Hardford, Newport, (Mon.), who were represented at the launch by Mr. W. J. Order. As she left the ways she was gracefully named *Muriel* by Miss Rita Miller, daughter of Mr. William Miller, of the Dockyard Co. The machinery will be supplied by Messrs. Hutson & Son, Glasgow.

Venus and Jupiter.—On September 1st Messrs. Mackie & Thomson, Govan, launched two steam trawlers, built to the order of Mr. W. Widdowson, of Hull. The vessels were christened the *Venus* and the *Jupiter*. The dimensions of each are:—Length, 110 ft.; over all, 117 ft. 6 in.; breadth, 21 ft.; depth, 12 ft.; and the gross tonnage 180 tons. The engines were supplied by Messrs. Muir & Houston, Glasgow, and were of 400 H.P. each. The *Venus* and the *Jupiter* are two of a fleet of trawlers which Mr. Widdowson has on order for engagement in the Hull steam trawling industry, and will sail from the Humber.

Bengalia.—On Thursday, September 1st, Messrs. Alex. Stephen & Sons launched at Linthouse a steel screw steamer built to the order of Sir Christopher Furness for the Hamburg-America Co. The vessel has been built under special survey, class 100 A1, with many additions of extra strengthening for Atlantic trade. Her length is 500 ft., and she has a cubic measurement cargo capacity of nearly 20,000 tons. The upper and main decks are of steel all fore and aft. There is a shelter deck extending all fore and aft, with special strengthening for Atlantic weather. This deck is fitted throughout with the most improved modern appliances and for carrying cattle. Further cattle space is provided on an upper bridge about 120 ft. long. The vessel will carry about nine hundred head of cattle in all. The accommodation for captain and officers is provided for in large deck-houses on the upper bridge; while the seamen and firemen are located on upper deck forward, and the cattlemen on the same deck aft. The vessel has a cellular double-bottom all fore and aft, and also a deep ballast tank. The portion of double bottom under machinery space is subdivided and arranged for carrying fresh water for cattle, with all necessary pipes and connections, &c., for distribution throughout the cattle spaces. The whole of the cargo compartments are fitted with grain divisions. Special care has been taken in the ventilation in all parts of the ship. No fewer than 14 powerful steam winches and 30 derricks are provided in order to secure the most convenient and rapid handling of cargo. Combined hand and steam-steering gear is fitted in house on the after-end of the shelter-deck. Electric lighting is provided throughout the entire ship—which will, when completed, be one of the best equipped cargo and cattle steamers afloat. Her engines will have cylinders 30 in., 50 in. and 83 in. diameter by 60 in. stroke, with four boilers fitted with Howden's forced draught, and working at 180 lbs. pressure. The steamer, which is the first of two constructed to the order of Sir Christopher Furness for the above company, was named the *Bengalia* by Mrs. John Stephen, Domira, Glasgow. This is the tenth vessel built by Messrs. Stephen to the order of Sir Christopher Furness.

Firth Fisher.—On September 2nd there was launched by Messrs. John Fullerton & Co., Paisley, a steel screw steamer of 600 tons measurement, which has been constructed to the order of Messrs. James Fisher & Sons, Barrow-in-Furness, for that firm's carrying trade, and is fitted with steam windlass, steam steering gear, and all modern appliances for efficient working of ship and cargo. Compound engines of 700 I.H.P. are being supplied by Messrs. Ross & Duncan, Govan. The steamer was named *Firth Fisher* by Mrs. Fullerton, Abbotsburn, Paisley.

Heathville.—On September 2nd Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel screw steamer about 2,100 tons net register tonnage and 3,350 tons gross tonnage, and to carry 5,400 tons deadweight, for Messrs. Deas, Foster & Co., 27, Leadenhall Street, London, E.C. The following are the principal dimensions:—Length, b.p., 330 ft.; breadth, 45 ft. 6 in.; depth, moulded to spar deck, 26 ft. 6 in. The vessel has been built to the highest class at Lloyd's on the deep frame system, and is fitted throughout with a double cellular bottom for water ballast, the after peak also being utilised for this. All the newest requirements for quick loading and discharging and working of the ship have been supplied. Shifting boards can be fitted, and the hatchways are arranged to act as feeders when carrying grain in bulk. The vessel is schooner rigged, and the topmasts are made to telescope so that the vessel can pass under the bridges on the Manchester Canal. The accommodation for the officers and crew is of the most complete description, the saloon, captain's room, and two spare state-rooms being in large deck-house on bridge deck. The officers' and engineers' rooms are housed alongside engine casing, and are replete with every comfort, while the crew are berthed under the topgallant forecastle. The machinery, which is being supplied by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system. The cylinders are 24 in., 40 in., and 65 in. diameter by 42in. stroke, steam being supplied by two large boilers working at 180 lb. pressure. The vessel has been built under the superintendence of Messrs. Clark & Aiton and of Captain Hocken; the latter will also take command of the vessel when she is finished. As the steamer left the ways she was gracefully named the *Heathville* by Mrs. R. Hocken, wife of the captain who is to command.

Omrah.—On September 3rd there was launched from the yard of the Fairfield Shipbuilding and Engineering Co., Limited, Govan, a screw steamer of about 8,650 tons gross, and 8,500 I.H.P., which they have built for the Orient Steam Navigation Co. The dimensions of the vessel are:—Length, over all, 510 ft.; length, between perpendiculars, 490 ft.; breadth, 56 ft. 9 in.; and depth, 37 ft. 6 in. She has a straight stem and elliptical stern, and there are five decks. The vessel has been built to meet the requirements of the Board of Trade for passenger certificate, and also under special survey and with scantlings as required by Lloyd's latest rules for the 100 A1 class. There is a cellular double bottom the full length of the ship, and the holds are subdivided into separate compartments by watertight bulkheads—which are arranged and constructed to meet the recommendations of the Bulkhead Committee—with a strong collision bulkhead forward. The holds are so subdivided that even if two of the largest compartments are filled with water the vessel will have sufficient surplus buoyancy to keep afloat. She is fully equipped for employment as an armed cruiser, and her name will be placed on the Admiralty list for that purpose. She will have one large funnel, and her two pole masts will be fitted with derricks and fore-and-aft sails. When completed the vessel will have accommodation for about 330 first and second-class passengers on the main and spar decks and for 500 third-class passengers on the lower deck. The cabin accommodation is of the most comfortable description, the state-rooms being arranged for two, three, and four persons. In several of the cabins the lower berths are fitted to draw out and make double berths. The fittings are all of the most modern style and of the best quality. The first-class entrance is in the forward part of the ship on the promenade deck, and it leads direct to the dining saloon, a spacious room on the spar deck, lighted by a skylight and well from the boat deck, and by large square windows in the sides. The captain's day cabin and the officers' accommodation are at the forward end of the boat or shelter deck. The engineers' is in cabins amidships on the port and starboard sides of the spar deck. The question of ventilation has been very carefully studied, and a most complete system adopted to ensure the comfort of passengers and crew on the voyage to and from Australia is fitted. A continuous water service will be supplied, and the installation of electric lighting on board will be complete. Electric bells will be fitted to the cabins, saloons, &c. There will be a very large refrigerating plant with an insulated chamber for the storage of meat, poultry, milk, fruit, &c., and, in addition, wine and vegetable rooms. The cargo hatches will be equipped with six patent duplex winches for the despatch of cargo, and two of these will be so arranged that they may be used for hoisting and lowering the boats. A full outfit of boats, life-saving appliances, and all the other details required by the Board of Trade will be provided. Steam steering gear will be fitted to be worked either at the engine or from the bridge, and there will be reserve hand gear connected to the rudder head, having two large wheels. The machinery will consist of two sets of triple-expansion engines, each set having three cylinders — high pressure, medium, and low pressure—and three cranks. The high-pressure cylinders are fitted with piston valves, the medium and low pressure having ordinary flat slide valves. All are worked by the usual double eccentric and link motion valve gear. Each reversing gear is controlled by a combined steam and hydraulic reversing engine. The crank shaft is in three pieces, each piece being built and interchangeable, and, together with the thrust, tunnel, and propeller shafts, is of forged mild steel. Each screw propeller has four blades of manganese bronze, the boss being of cast steel. The condensing water is circulated through the condensers by two large centrifugal pumps, one for each condenser, and each worked by an independent engine. Each pump is capable of supplying the circulating water required by both main engines in the event of one pump being disabled. Both circulating pumps are connected to large valves leading to the bilges, so that, in the event of a serious leak in the ship, they can be utilised for pumping out the engine-room. The engine-room is fitted with all modern appliances, and includes two evaporators for making fresh water to supply the boilers, a large feed filter, and a suitable feed heater, also all other necessary fittings to ensure economy of working. The boilers for generating the steam for the engines are five in number—viz., three double-ended and two single-ended, of the ordinary multitubular marine type, and arranged to work with forced draught. Each of the double-ended boilers has eight furnaces and each of the single-ended four, making a total of 32 furnaces. The boilers are constructed entirely of steel, and are adapted for a working pressure of 180 lb. per square inch. There will also be an auxiliary boiler for supplying steam to the donkey pumps, fresh water condenser, galleys, &c. The christening ceremony was performed by Mrs. E. Garrett Anderson, M.D., of London, who named the vessel *Omrah*.

Sea Serpent.—On September 5th there was launched at Dumbarton, a steel schooner-rigged steamer of about 781 tons gross, named the *Sea Serpent*, for Charles F. Leach, Esq., of London.

Surf.—On Saturday, September 17th, Messrs. Ramage & Ferguson, Limited, Leith, launched a steam yacht of 500 tons, built to the order of Mr. Frank D. Lambert, from designs by Messrs. Cox & King, London. On leaving the ways the yacht was named *Surf* by Miss Rayne, Morpeth.

Trawler.—On September 17th Messrs. John Duthie, Sons & Co., Aberdeen, launched a finely-modelled steam trawler, built to the order of the Southern Steam Trawling Co., Waterford, Ireland. The vessel is 111 ft. in length, her gross tonnage being 183. This is the fifth of six trawlers which the Messrs. Duthie are building for the Southern Steam Trawling Co.

Steel Screw Steamer.—On September 20th Messrs. Russell & Co., Port-Glasgow, launched to their own account a steel screw-steamer of 5,200 tons register. The dimensions are—Length, 340 ft.; breadth, 46 ft.; depth, 28 ft. 6 in. Messrs. Rankin & Blackmore, Greenock, will supply triple-expansion engines.

Italiana.—Messrs. Robert Duncan & Co., Limited, launched at Port-Glasgow a steel screw steamer of about 3,000 tons gross, contracted by Sir Christopher Furness for the British Maritime Trust, London. As she left the ways she was named *Italiana* by Mrs. M'Lean, of Bearsden. After launching the vessel was towed to Glasgow to receive her machinery, which has been constructed by Messrs. Hall-Brown, Buttery & Co., of Govan.

TRIAL TRIPS.

Statendam.—On August 18th the steamer *Statendam*, built by Messrs. Harland & Wolff, Limited, to the order of the Holland-American Line, left her moorings at the Alexandra Wharf, and proceeded down the lough for trial and adjustment of compasses. The tonnage of the *Statendam* is about 10,400 gross, and her dimensions are:—Length, 515 ft.; breadth, 59 ft. 6 in.; depth, 43 ft. 6 in. She is propelled by two sets of engines, and is equipped with installations of electric light and refrigerating machinery. Accommodation has been provided for a considerable number of passengers, for whose comfort every convenience has been provided, and the ship will likewise be capable of carrying a large cargo. The *Statendam* is to run between Rotterdam and New York, the same service in which the *Rotterdam*, already built by Messrs. Harland & Wolff, Limited, for the same company, is now engaged.

Tuskarora.—On August 20th the monster steamer *Tuskarora*, built by Sir James Laing, Sunderland, for the Anglo-American Oil Co., London, proceeded from the Tyne on her official trial trip. The *Tuskarora* is the largest oil steamer afloat, and her gross tonnage is 6,248 tons register.

Bielefeld.—On August 20th the s.s. *Bielefeld* proceeded on her trial trip. She was built to the order of the Deutsch Australische Dampfschiffe Gesellschaft in Hamburg, by the Flensburg Shipbuilding Co. Her dimensions are:—403 ft. 8 in. by 47 ft. 8 in. by 31 ft. depth moulded, is classed to Lloyd's 100 A1, spar-deck with full poop and topgallant forecastle for crew and accommodation for officers in deckhouses on top of poop amidships. The trial was very satisfactory, and the engines of 2,500 H.P., also built by the Flensburg Shipbuilding Co., gave the vessel an average speed of 13½ knots. After the trial the steamer went to Hamburg.

Nippon Maru.—On August 20th this vessel was taken for her official trial on the measured mile at sea, when she made an average speed of 16¼ knots, and engines worked in a very satisfactory manner. This vessel is one of the first of a fleet of twin-screw mail and passenger steamers being built to the order of Messrs. M. Samuel & Co., of London, on behalf of the Toyokisen Kabushiki Kaisha, of Tokio, Japan, and has been built by Sir James Laing, of Sunderland, and is in length 441 ft., depth, moulded, 22 ft. 6 in.; breadth, 50 ft. 6 in. The engines, by Messrs. George Clark, are in duplicate, with cylinders 28¼ in., 46 in. and 75 in., with a stroke of 48 in., and are driven by four double-ended and one single-ended boiler, which give a total heating surface of 20,000 square feet. This vessel has been built under the direct supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, with whom is associated Captain Tomioka, the owners' representative in the country. This vessel is built to Lloyd's highest class, and has all the latest improvements for this class of vessel, the passenger accommodation being fitted up in a most luxurious manner and is arranged to carry 89 first-class and 28 second-class passengers with servants, and 200 emigrants. After the trial the vessel returned to the Tyne to partially load before leaving for London.

Marjorie.—On August 23rd the new steamer *Marjorie*, recently launched from the yard of the Strand Slipway Co., of Sunderland, when the ceremony of naming the steamer was most effectively performed by Miss Marjorie Locket, went out for her load trials which were for a three hours' consecutive run, the results obtained, with and against the tide, giving a mean speed of slightly over 10 knots. The vessel, which has been built to the order of Messrs. Locket & Judkins, of London, has been constructed to meet the requirements of the highest class in Lloyd's Registry, with a raised quarter deck, bridge, and high forecastle, and is constructed with web frames, cellular double bottom in which, together with the fore peak tank, 316 tons of water ballast can be carried, the dimensions are:—Length, 224 ft.; breadth, 30 ft.; depth, moulded, 15 ft. 3 in., giving a depth of hold of 12 ft. 8 in., and on deadweight of 1,300 tons a mean draught of 13 ft. 8 in. The engines, which are placed aft, have been constructed by Mr. G. T. Grey, of Holborn Engine Works, South Shields, are of triple-expansion type, having cylinders 25 in., 28 in., and 48 in. by 33 in. stroke, steam being supplied at 160 lbs. pressure from one large multitubular steel boiler, 14 ft. 6 in. diameter, by 10 ft. long, having three furnaces 42 in. diameter, built by Messrs. Joseph Eltringham & Co., a Radio-Mundel evaporator, and also a feed-heater, are fitted together with a large ballast pump of the Worthington Co. On the trial the engines developed over 700 I.H.P., working throughout with the greatest smoothness. On deck is fitted a "Sentinel" steam steering gear, and also a steam windlass for heaving in the stockless anchors, three large steam winches together with a large donkey boiler, whilst to facilitate the handling of the boats, the Collapsible Boat Chocks (Hamlyn's patent) have been fitted, by means of which the chocks fall, and the gripes can be released in a few seconds by the lifting of a lever and the boats are left suspended in the davits ready for swinging out. The vessel being intended for the coal trade, special care has been taken to afford every facility for dispatch both in loading and discharging, large hatchways being provided. The design and construction of the vessel and her machinery has been carried out under the supervision of Mr. Harry Gray, consulting engineer and marine surveyor, of 110, Fenchurch Street, London, E.C., on behalf of the owners.

Glosterhill.—On August 24th the steamer *Glosterhill*, which has been built by Messrs. Osbourne, Graham & Co., of Hylton, for the Broomhill Shipping Co., left the Wear on her trial trip. The vessel is 225 ft. long, 36 ft. on the beam, and her moulded depth is 15 ft. 6 ins. She has been built to carry 600 tons, and is chiefly intended to be used in the Baltic trade. She will steam about 10 knots an hour. The *Glosterhill* has been engined by Messrs. George Clark, Limited, Southwick. The vessel was taken several times over the measured mile, and then she proceeded to Amble to take in her first cargo.

William Broadley.—On Wednesday, August 24th, the fine screw steamer, *William Broadley*, built for the Red "R" Steamship Co., Limited (Messrs. Stephens & Mawson, managers), of Newcastle-on-Tyne, by the Blyth Shipbuilding Co., Limited, went to sea for her trial trip previous to being loaded. The dimensions of this vessel are as follows:—Length, 337 ft.; breadth, 47 ft.; and depth, 24 ft. 10 in., and she has been built to Lloyd's highest class, and to carry a large cargo on an easy draft of water. The ballast tank under the boilers is fitted with a patent system of ventilation, so as to save the deterioration of the tank. Messrs. Blair & Co., Limited, of Stockton, have supplied the engines, which are of the triple-expansion kind, having cylinders 24 in., 40 in., and 65 in. by 42 in. stroke. The vessel left Blyth about mid-day, and had on board the directors and managers of the Red "R" Steamship Co., representatives of the builders and engineers, and several friends. Numerous runs were made over the measured mile with gratifying results to all concerned, and in fact the performance of both ship and machinery was considered in every way highly satisfactory. During construction the hull and engines have been under the superintendence of Mr. Cowen Landreth, the owner's engineer. In addition to other work the Blyth Shipbuilding Co. has in hand, they are at present building another vessel of the same dimensions for Messrs. Huddart, Parker & Co., Limited, of Sydney.

Truro.—On August 25th, the steamer *Truro*, the third of the four vessels which the Caledon Shipbuilding and Engineering Co., Limited, Dundee, have on order for Messrs. Thomas Wilson, Sons & Co., Hull, made her official trial trip. The steamer left Camperdown Jetty in the forenoon, and proceeded to the Bell Rock, where she cruised about for some time. Afterwards she was headed for the measured mile between Arbroath and Auchmithie. Several speed trials were there made, and the vessel performed satisfactorily, a speed of about 14 knots being attained.

Albertville.—On Friday, August 26th, the fine mail and passenger steamer, *Albertville*, built by Sir Raylton Dixon & Co., Limited, Cleveland Dockyards, Middlesbrough, to the order of Messrs. Elder, Dempster & Co., of Liverpool, for Compagnie Belge Maritime du Congo of Antwerp, was taken out to sea for her official trials under the command of Captain Tubbs. This vessel will run in the Belgian mail line between Antwerp and the West Coast of Africa, and is similar to the *Bruxellesville*, *Jebba*, and *Leopoldville*, lately built by Sir Raylton Dixon & Co., Limited. Her dimensions are:—Length, 364 ft.; beam, 44 ft.; depth, moulded, 26 ft. Accommodation has been provided in most spacious and handsomely fitted cabins for 100 first-class and 60 second-class passengers, with large dining room panelled in marble and inlaid wood in house on deck. The first-class smoking-room, second-class smoking-room and cabin entrances are elaborately fitted and decorated, and the vessel is lighted throughout with electric light: a powerful refrigerating machine (with large cooling chambers) is also provided for the conveyance of fresh meat, provisions, &c. Triple-expansion engines have been fitted by Messrs. T. Richardson & Sons, Limited, Hartlepool, having cylinders 27 in., 43 in., 72 in. by 48 in. stroke, supplied with steam by three large double-ended boilers, working at 180 lbs. pressure. A small party of friends were on board during the trials, including the Hon. Charles A. Duff Miller (Agent-General for New Brunswick) and party. The trials were most successful, a mean speed of 13 knots being easily attained.

Trigonia.—On August 26th this vessel was taken for trials at sea, when she made an average speed of 10 knots. This is the first of two vessels being built on the trunk system by Messrs. Armstrong, Whitworth & Co. for Messrs. M. Samuel & Co., of London. Her dimensions are:—248 ft. 6 in. long, 40 ft. beam, 17 ft. 8 in. depth. The engines are of the compound condensing type, supplied by steam from two boilers working at a pressure of 100 lbs., cylinders being 30 in. and 63 in. by 39 in. stroke. Both engines and boilers have been specially designed and constructed under the supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool. This ship is intended to burn liquid fuel on her service in the East, and her engines and boilers have been fitted out with this special view. Electric light is fitted throughout the ship, and there is a complete installation of duplex pumps for dealing with oil cargo. The bunkers of this vessel are made oil-tight, and specially stayed so as to contain oil fuel, and are also available for coal in case of emergency. The sea trials were made with both liquid fuel and coal, and were very satisfactory.

Queenmoor.—On August 27th the *Queenmoor* proceeded on her trial trip, which proved in every way satisfactory, the engines working with great smoothness, a mean speed of 11 knots being obtained. The steamer has been built to the order of Messrs. Walter Runciman & Co., London and Newcastle, by Messrs. John Blumer & Co., Sunderland. After the trial the vessel proceeded to the South Dock to load her first cargo for Galatz.

Ethel.—On August 27th the *Ethel*, built by Messrs. Richardson, Duck & Co., for Messrs. Burdick & Cook, o London, was taken to sea for her trial trip, after shipping over 500 tons of bunkers at the Stockton Corporation wharf. On the trial the vessel obtained a speed of 11 knots, which was considered very satisfactory. The steamer *Ethel* is a steamer of the partial awning-deck type, with a deadweight carrying capacity of 3,600 tons on a light draught of water.

Majestic.—On August 30th the powerful tug *Majestic*, built at M'Clelland's Slipway, Willington Quay, to the order of the Grimsby and Deep Sea Towing and Salvage Co., Limited, was taken to sea on an official trial trip. She was taken over the measured mile and achieved a speed considerably in excess of that guaranteed.

Wladimir Sawin.—On Thursday, September 1st, the steamship *Wladimir Sawin*, built by Messrs. Craig, Taylor & Co., Thornaby-on-Tees, was taken to sea for her trial trip, which proved highly satisfactory. The vessel has been built to the order of Der Dansk-Russiske Dampskibsselskab, Copenhagen (Martin Carl, Esq., manager). Her dimensions are 280 ft. by 41 ft. by 18 ft. 9 in., and she is of the partial awning deck type. She carries about 3,100 tons deadweight on a light draught of water, and is fitted with all modern improvements for economical working. The engines, which have been constructed by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, Middlesbro', are of the following sizes, viz., 20 in., 32½ in., 53 in., and 86 in., with two large boilers, 160 lbs. pressure, and during the whole of the trip they worked without the slightest hitch, a speed of 10 knots being easily maintained. The vessel afterwards proceeded to the Tyne under the command of Captain Jorgensen.

Pola.—On September 3rd the new screw steamer *Pola*, built by Messrs. John Readhead & Sons, West Docks, South Shields, to the order of the English and American Shipping Co., Limited, of which the managers are Messrs. C. T. Bowring & Co., London, was taken to sea on her official trial trip, and had a series of successful runs, averaging a speed of 12 knots. The vessel, which is 323 ft. long, 47 ft. broad, and 25 ft. deep, is of the improved single-deck type with full poop, long bridge amidships, with cabin-house on deck for captain and officers, and topgallant forecastle for crew, and has a large deadweight capacity on a light draught. She has been built under special survey, and classed 100 A1 at Lloyd's. Her engines, which have also been constructed by Messrs. Readhead and Sons, are of the triple-expansion type, having cylinders 24 in., 40 in., and 64 in. by 45 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lb. per square inch. After the trial the vessel returned to the Tyne to load for Genoa, under the command of Captain William Towill.

Haliotis.—On September 3rd this vessel was taken for trial at sea, when she made an average speed of 10 6 knots. This is the second of two vessels built on the trunk deck system by Messrs. Armstrong, Whitworth & Co. to the order of Messrs. M. Samuel & Co., of London. Her dimensions are:—Length, 248 ft. 6 in.; breadth, 40 ft.; and depth, 17 ft. 8 in. The engines are of the compound surface condensing type, taking steam from two boilers working at 100 lbs. pressure, the diameters of the cylinders being 30 in. and 63 in., with a stroke of 39 in. Both engines and boilers have been specially designed and constructed under the supervision of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool. The ship is intended to burn liquid fuel on her service in the East, and her engines and boilers have been fitted out with a special view to this. Electric light is fitted throughout the ship, and there is a complete installation of duplex pumps for the rapid dealing with oil cargo. The bunkers are made oil tight and specially stayed so as to contain oil fuel, and are also available for coal in case of emergency. The above trial was made with coal, and was very satisfactory, and on the arrival of vessel in London, extended trial with oil fuel will be made, and the various data and consumptions under the two systems carefully compared.

Joseph Merryweather.—On Saturday, September 3rd, the fine steel screw steamer, *Joseph Merryweather*, had her official trial trip. This vessel has been built by Messrs. William Gray & Co., Limited, to the order of Councillor W. S. Merryweather, of Hartlepool. The vessel takes Lloyd's highest class; she is 300 ft. in length over all, 42 ft. in breadth, and 21 ft. 9 in. in depth. Triple-expansion engines, having cylinders 21½ in., 35 in., and 58 in., with a piston stroke of 39 in., have been supplied by the Central Marine Engine Works of the builders, together with two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel went out about four o'clock in the morning, and after having a preliminary run and her compasses adjusted by Mr. Berry, was boarded about noon by a large party of visitors and gentlemen interested, amongst whom were Councillor W. S. Merryweather, managing owner; Mr. Joseph Merryweather, Alderman J. F. Wilson, Mayor of West Hartlepool; Alderman John Horsley, Mayor of Hartlepool; Mr. R. H. Coverdale, Mr. J. B. Guthe, Mr. Pinder, Mr. Gates, and Mr. Routledge, of Welbury, Yorkshire; Captain J. Lilly, and Captain Watson, harbour master. Captain Murrell represented the shipbuilders; Mr. W. C. Borrowman and Mr. Lindsay the engine builders; and Mr. John Black the owners of the ship. The vessel had an extended trial, taking several runs along the coast, her mean speed averaging about 11½ knots. The engines ran very smoothly, and without hitch, and great satisfaction was expressed with the performance of both ship and machinery. A capital luncheon was provided by the owners, for which the caterer to the Gentlemen's Club in West Hartlepool was responsible. The usual loyal and other toasts were proposed, and duly honoured. At four o'clock the visitors were disembarked, and the vessel proceeded to Blyth to load for Alexandria.

Titan.—On September 5th the twin screw tug boat *Titan*, which has just been built by Day, Summers & Co., Northam Iron Works, Southampton, for the Union Steamship Co., went out for her official trial, when the results obtained were exceedingly satisfactory. After passing Hythe Pier the engines were put to full speed and kept going at that speed without a single stoppage until the return to the docks late in the afternoon. The speed obtained on the measured mile was 10¾ knots, being considerably in excess of the speed required by the company. The dimensions of the tug are as follows:—Length on water line, 100 ft.; breadth, 21 ft.; depth, 9 ft. 6 in.; tonnage, B.M. 205. The vessel is fitted with two sets of compound surface condensing engines, with cylinders 12 in. by 22 in. diameter, the stroke being 21 in. There is one boiler, 11 ft. 3 in. diameter by 10 ft. long, the working pressure being 110 lbs. On the return of the vessel to the Southampton Docks she was taken over by the company, and has already started on her voyage to the Cape, having sailed on the 8th inst.

Maria.—On Monday, September 5th, the large steel screw steamer *Maria* left the Wear for her trial trip. She has been built by Messrs. John Priestman & Co., Southwick, to the order of Jos. de Poorter, of Rotterdam, and is of the following dimensions:—Length, 352 ft.; breadth, 48 ft.; depth, moulded, 29 ft. The vessel is of the spar-deck type, with long bridge amidships, and will be classed 100 A1 at Lloyd's. Six steel bulkheads divide the vessel into watertight compartments, and the double bottom will provide for ample water ballast. Special attention has been devoted to the loading and discharging arrangements, and there being five large hatchways, worked by powerful steam winches, derricks, and all the most modern gear for the rapid working of cargoes. The steam steering-gear is placed at the after-end of the engine casing, with controlling rods to wheelhouse on flying bridge. On the bridge deck is a large house for the accommodation of the captain and officers the engineers being berthed at the after-end of the bridge and the crew forward. The engines are by Messrs. Wm. Allan & Co., Limited, Scotia Engine Works, Sunderland, the cylinders being 25 in., 41 in., and 67 in. diameter, stroke 45 in. Two large boilers supplied by the same firm, have a working pressure of 160 lbs. per square inch. The trial proved most successful, a speed of 11 knots being attained, the engines working smoothly and without a hitch of any kind. Among the company on board were Messrs. Jos. de Poorter, John Priestman, D. Huntley, and G. H. Strong, M.I.N.A., of Hull, who has superintended the vessel during construction. After the trial the vessel left for Philadelphia under the command of Captain Lutz.

Janet.—On September 6th the new steel tug-boat *Janet*, built by Mr. Joseph Scarr, of Beverley, for T. T. Munkman, Esq., of Hull, went on her official trial trip. Her dimensions are as follows, viz., 85 ft. between perpendiculars, and 18 ft. beam, and 10 ft. depth. She is fitted with all the latest improvements for coast and continental towing, including steam windlass, &c. The vessel has been built to class 100 A1 Lloyd's Register. The machinery was supplied and fitted on board by Messrs. Cooper & Co., Neptune Street, Hull, and consists of a set of triple-expansion engines, having cylinders 11 in., 18 in., and 30 in., with 22 in. stroke, working at 165 lbs. pressure, the steam being supplied by one large steel boiler. After the usual manœuvring for adjustment of the compasses the vessel proceeded to sea, where a speed of 11 knots was attained. At the conclusion of the trial the owner expressed himself highly satisfied with the smooth working of the engines and the general equipment of the boat.

City of Corinth.—On September 6th the *City of Corinth*, a new liner built by Messrs. Workman, Clark & Co., Belfast, for Messrs. Geo. Smith & Son, Glasgow, went down the Firth of Clyde on a trial cruise. The vessel was taken from Belfast a few days ago, and on the run across channel she had made a speed of 14 knots. The present cruise was from Gourock to Arran and back. There were on board about 400 invited guests, and as the weather and the vessel were all that could be desired, the outing was most enjoyable. The new steamer, which was launched in February last, is of 5,443 tons gross, 430 ft. long between perpendiculars, 50 ft. broad, and 32 ft. 6 in. deep. She will accommodate 102 first-class passengers, and will be engaged in the Calcutta trade. She is schooner-rigged, and has tanks for 1,050 tons of water ballast. The engines, also by Messrs. Workman, Clark & Co., are of 3,800 I.H.P., triple-expansion, with cylinders 28 in., 47½ in., and 78 in. diameter respectively, and a stroke of 60 in. Two double-ended boilers, constructed for a working pressure of 190 lbs., are provided. The *City of Corinth*, which is the eighth and largest vessel Messrs. Workman, Clark & Co. have built for the City Line, has been constructed under the superintendence of Captain Anderson, and will be commanded by Captain Black, late of the *City of Sparta*.

Elsa.—On September 8th the s.s. *Elsa* went on her trial, and a speed of 9 knots was attained. The deadweight capacity was 830 tons on 11 ft. 6 in. draught. The vessel, built for the Neue Dampfer Compagnie, in Stettin, was launched from the yard of the Flensburg Shipbuilding Co., and has the following dimensions:—Length, over all, 208 ft.; breadth, extreme, 29 ft.; depth, moulded, 14 ft. 1 in. The engines and boilers have been fitted also by the Flensburg Shipbuilding Co., the cylinders being 23 in., 42 in. and 27 in. stroke. The vessel is built for the run between Stettin and Konigsberg, and has German Lloyd's highest class. Accommodation for six first-class passengers are fitted amidships. The lifeboats are placed on bridge-deck and fitted with Mr. De Vos' patent system of swinging the boats in and out.

Ajax and Velox.—On September 8th the steamers *Ajax* and *Velox*, built by Messrs. Carmichael, Maclean & Co., Greenock, for Messrs. R. Simpson & Co., Hull, went down the Firth on their trial trip. The dimensions of the vessels are:—130 ft. by 23 ft. by 11 ft., moulded, classed 100 A at Lloyd's. These vessels have been specially built for carrying fish from the North Sea to the London market. The engines have been supplied by Messrs. Bow, M'Lachlan & Co., Paisley, and during the trial worked smoothly. A speed of 11½ knots was attained, which was considered satisfactory.

Winifred.—On Saturday, September 10th, the new stee screw steamer *Winifred*, built by Irvine's Shipbuilding and Dry Docks Co., Limited, proceeded to sea. This vessel has been built to the order of the Pyman Steamship Co., Ltd., of West Hartlepool, and is classed to Lloyd's 100 A1 class. The principal dimensions are as follows, viz.:—Length between perpendiculars, 320 ft.; breadth, 46 ft.; depth, 23 ft. 0½ in., and will carry 4,785 tons on a draught of 19 ft. 10½ in. to Lloyd's freeboard. She has a cellular double bottom for water ballast all fore and aft, also in after peak tank, steam steering gear fitted in engine-room with controlling shaft to the bridge, double derricks at each hatch, and all the latest appliances for a first-class cargo steamer, having a bridge 160 ft. long, and is arranged so that it is most suitable for the carrying of cattle, etc. The machinery, which has been built by Messrs. Thos. Richardson & Sons, Ltd., of Hartlepool, consists of a set of triple-expansion engines, having cylinders 24 in., 38 in. and 64 in. by 42 in. stroke, steam being supplied by two large single-ended boilers, working at a pressure of 160 lbs. After the vessel's compasses were adjusted her head was turned seawards and the engines set going at full speed, making several runs, and the greatest satisfaction was expressed with the performance of both ship and machinery, the mean speed being about eleven knots. The *Winifred* has been built under the superintendence of Mr. Cromar, the company's superintendent, and from the date of launching until the date of completion, the time was only 19 working days.

Pearl.—On September 10th the new steamer *Pearl* went out to sea for her official trial trip. The vessel has been built by Messrs. Wood, Skinner & Co., Bill Quay-on-Tyne, to the order of Captain Wetherall, of Knottingley, and is of the following dimensions, viz.:—Length, 195 ft.; breadth, 29 ft.; depth, 14 ft.; and will carry 1,000 tons deadweight. She has cellular double bottom fore and aft, steam steering gear, and the usual appliances of a first-class cargo steamer. The machinery, which has been built by the North-Eastern Marine Engineering Co., Limited, Wallsend, consists of a set of their latest triple-expansion engines, having cylinders 16 in., 26 in. 43 in. diameter by 30 in. stroke, steam being supplied by a large steel boiler working at 160 lb. pressure. During the trial the engines worked with smoothness, a speed of 10½ knots being easily obtained, which was considered very satisfactory.

Gosforth.—Lately the new steamer *Gosforth*, built by Messrs. Wood, Skinner & Co., Limited, to the order of Messrs. Burnett & Co., of Newcastle, had a very successful trial trip on the official course off Whitley. The vessel is 220 ft. in length, 33 ft. in breadth, and 16½ ft. in depth. Her engines have been supplied by the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne, and are constructed on their latest triple-expansion method, with cylinders 17½ in. by 28 in. and 46 in., with a 33-in. stroke, her large steel boiler working at a registered pressure of 160 lbs. During the trial on a series of runs, some against a strong wind and adverse tide, a speed of 10 knots was registered.

Heathmore.—On Saturday, September 10th, the steamer *Heathmore* ran her official trial trip in Liverpool Bay. This ship was built by Messrs. Workman, Clark & Co., Belfast, and towed to Liverpool to be engined by Messrs. David Rollo & Son, this firm having the contract for the ship's machinery with the exception of the donkey boiler and deck winches. The *Heathmore* is a vessel of good appearance, with poop bridge and forecastle, and plate bulwarks. She is schooner-rigged, fitted with telescope topmasts, and is built of steel, on the cellular double bottom plan, and to the British Corporation B.S. * class, having been constructed under that corporation's special survey. The *Heathmore* has been built for the Mediterranean and Baltic trade, consideration having also been given to the South-American cotton trade, in which she will, when occasion offers, take part. A perfect system of shifting boards is fitted throughout the ship, effectually dividing her fore and aft, and making her specially safe as a carrier of cereals. Her principal dimensions are:—Length, 331 ft.; beam, 46 ft. 3 in.; depth, 26 ft. 9 in. Her net register tonnage is 2,025, and her deadweight carrying capacity 5,250 tons, while her water ballast capacity is 900 tons. Forward a powerful steam windlass is provided. Under the top-gallant forecastle the crew—seamen and firemen—are accommodated, also the petty officers, besides which there is a lamp-room, &c. Under the bridge deck is a large open space, the forepart being bulkheaded, having doors opening on the forward deck, the after end being open. On the bridge deck the accommodation for officers and engineers is provided, the officers in a house at the forward-end, which contains also the dining saloon, and the engineers in a house at the after-end of this deck, the rooms being outside the engine-room casing; while the galley is placed on the after-side of the casing. The officers and engineers' accommodation has been well considered and is both cominodious and comfortable. On top of this forward house is situated the chart-room, lower steering house, abaft of which, connecting by door, is the captain's bridge berth. Above this again is the flying bridge. The poop house contains no accommodation, but will make an excellent storeroom. The hand steering gear is on the poop, being of the ordinary right and left handed screw pattern, of very substantial make. The steam-steering engine, of an approved type, is placed at the after end of the upper engine-room platform, level with the main deck. The vessel is propelled by a pair of triple-expansion engines. The diameters of the cylinders are 23½ in., 39½ in. and 68 in. respectively, with a piston stroke of 42 in. Owing to the high-pressure steam

(200 lbs.) which is used, the high-pressure and intermediate cylinders are fitted with piston valves, the low-pressure valve being an ordinary D slide fitted with a balance. The guide blocks are of patent metal, while they are also fitted behind with a water service. The auxiliary machinery consists of evaporator, feed heater, feed filter, and a large-sized ballast pump of Messrs. Rollo's (standard) make, of considerable capacity, and which can also be used for other pumping purposes when necessary. The starting gear is on the all round principle, arranged to work the turning gear. The thrust block is of the horse-shoe type, with large collars, having a separate water service each. The valve gear is the ordinary link motion. Steam is supplied by two steel boilers, at a pressure of 200 lbs. to the square inch. The boilers measure 15 ft. 3 in. by 10 ft. 6 in., and 4,300 ft. heating surface, and 116 ft. grate surface, the cooling surface being 2,200 ft. The propeller is four bladed, 17 ft. diameter, 17 ft. pitch, and 18 ft. surface. Natural draught is used. The engines are designed to drive the ship loaded at a speed of 10 knots, with 60 revolutions. The arrangement of the engine-room is excellent, there being nothing crowded, and throughout this department there seems nothing to be desired. On the trial the engines ran at a maximum of 70 revolutions, and the utmost satisfaction was given. Amongst those who went in the ship for the trial were Mr. E. Johnston, Mr. Stuart Johnston, Mr. Massey (manager), Mr. F. W. Workman (Workman, Clarke & Co., and Mr. Rielly, builders), Messrs. George Rollo (sen. and jun.), Mr. M. Rollo (D. Rollo & Son), Mr. Mackenzie (engineer's manager), S. J. Pitcher (British Corporation), J. G. Garrick (superintendent engineer), W. G. Clarke (naval architect), Captain Inch (marine superintendent), and others.

Richmond Castle.—On Wednesday, September 14th, the s.s. *Richmond Castle*, of Liverpool, left Hull fully laden with 5,900 tons of cargo for the River Plate. Before proceeding on her voyage the vessel was put through an exhaustive progressive trial to test her steaming powers under both forced draught and natural draught. The trial proved very successful, a speed of 11 knots being well maintained, and the machinery throughout worked in a most satisfactory manner. The s.s. *Richmond Castle* has been built by Messrs. Wm. Pickersgill & Sons, of Southwick, and engined by Messrs. Geo. Clark, Limited, of Southwick, to the order of Messrs. Jas. Chambers & Co., of Liverpool, and is the fourth vessel built for this firm by these builders. She is a vessel of the spar-decked type, built to Lloyd's highest class, and fitted with all the latest improvements applicable to the up-to-date cargo steamer, and having electric lights fitted throughout. The dimensions are:—Length, 360 ft.; breadth, 46 ft. 3 in.; depth, 28 ft. 2 in. moulded, and her triple-expansion engines have cylinders 23½ in., 40 in. and 66 in., with 45 in. stroke, supplied with steam by two large boilers of 180 lbs. working pressure, and fitted with Howden's system of forced draught. The party on board included Mr. Walter Chambers, representing the owners, Mr. Geo. Clark, jun., representing the engineers, Mr. Fred Pickersgill, the representative of the builders, and Mr. E. H. Bushell, of Liverpool, consulting engineer.

Balder.—On September 15th the fine steel screw steamer *Balder*, built and engined by Messrs. Blackwood & Gordon, Port-Glasgow, for the Thule Steamship Co., of Gothenburgh, underwent her trial trip on the Clyde. The *Balder* is the first steamer constructed by the Port-Glasgow firm for this company, and her dimensions are:—Length, 246 ft.; breadth, 34 ft.; depth, to main deck, 16 ft. 6 in. She has been specially designed for accommodating a large number of passengers during the summer months; and, in conjunction with the *Bele*, will run week-end trips between Granton and Gothenburg. She has also a good cargo-carrying capacity, with ample facilities for loading and discharging. To serve this double purpose some of the state rooms are made portable, the space being intended for passengers in summer and cargo at other times. The first-class accommodation is situated amidships, the dining saloon, with seats for 50, being placed on the main deck in front of the machinery, and is well lighted. Abaft the dining saloon are several state-rooms, the remainder being arranged in a deck-house above the dining saloon. Besides the first-class accommodation, there is a comfortable and well ventilated saloon and sleeping accommodation aft in poop for 30 second-class passengers. In the forward part of the ship berths are provided for ten third-class passengers. The machinery consists of triple-expansion engines of the usual type, 21 in., 33 in., and 54 in., by 39 in. stroke, the main boilers supplying steam being two in number. For working cargo there are four steam cranes to lift 30 cwt. each and two steam winches. The steering gear, by Alley & Maclellan, is of the horizontal type, and is placed in a recess in the upper part of engine room and worked by a controlling shaft from the bridge. The steamer is lighted throughout by electricity, and is under the command of Captain Wittboldt. The trials on the measured mile at Skelmorlie were very satisfactory, a speed of 12¼ knots being obtained, which is above the guarantee. The *Balder* afterwards proceeded down the Firth and carried out successfully a six hours' steam trial. There was a representative company aboard, which included Mr. Olof Melin, managing director of the company; Mr. J. Johnson, naval architect, and Mrs. Johnson; Mr. and Mrs. F. P. Purvis; Mr. J. Macalpine (engineering partner), Messrs. Blackwood & Gordon, Mr. and Mrs. Macalpine, Miss Purvis, Miss Muir, Mr. Shafter, Mr. Grischotti (Swedish Vice-Consul in Glasgow), ex-Bailie Macfarlane, Mr. W. Gebbie, and Mr. R. Elliot (Lloyd's surveyor).

Coburg.—On September 16th the steamer *Coburg*, which Messrs. Gourlay Brothers, of Dundee, have lately built for Messrs. James Currie & Co., Leith, made her official trial trip. On account of thick weather, however, the speed of the vessel could not be tested on the measured mile between Arbroath and Auchmithie, but the whole working of the steamer gave satisfaction to those on board.

Scarthoe.—On September 16th the new steamer *Scarthoe*, built by Messrs. Ropner & Son, Stockton-on-Tees, to the order of Messrs. Bennetts & Co., Grimsby, made her official trial trip in the Tees Bay. This steamer has been built off the three-decked rule, and will carry a deadweight cargo of about 6,000 tons. The vessel is fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited. The trial trip was satisfactory, a speed of 10 knots being easily obtained, and the machinery working efficiently. After adjustment of compasses and completion of trials, the steamer left the Tees Bay for Baltimore direct.

Rhodesia.—On September 17th the new steel screw vessel *Rhodesia*, which has been built to the order of the Irvin Steam Fishing Co., had a very successful trial trip off the Tyne. The vessel, which was built by Messrs. R. & W. Hawthorn, Leslie & Co., Limited, is the third vessel that has been acquired for this company. The dimensions of the hull are 93 ft. by 18 ft. 6 in. by 10 ft. 6 in. The vessel is fitted with machinery, having cylinders of 14 in. and 30 in., by 21 in. stroke, with large boiler power, supplied by Messrs. Baird & Barnsley, of North Shields. The vessel maintained an average speed of 10 knots, which was considered highly satisfactory.

Ella Sayer.—On September 17th the new steamer *Ella Sayer*, built by the Tyne Iron Shipbuilding Co., Limited, Willington Quay, for Messrs. Fisher, Renwick & Co., Newcastle, went out to sea for her official trial trip. The following are the dimensions of the vessel:—Length, 313 ft.; breadth, 45 ft.; depth, 23 ft. She is built with a cellular double bottom, fore-and-aft. The machinery, which consists of a set of triple-expansion engines, having cylinders 22 in. by 36 in. by 61 in., with 39 in. stroke, steam being provided by two large steel boilers working at a pressure of 180 lb., have been supplied by the North-Eastern Marine Engineering Co., Limited, Wallsend. A speed of 11 knots was easily maintained, the engines working most efficiently, and the trial of ship and machinery was considered highly satisfactory.

Easingwold.—On Saturday morning, September 17th, the s.s. *Easingwold* was taken to sea for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, to the order of the London and Northern Steamship Co., Limited, London (Messrs. Pyman Bros., managers), and is a fine steel screw steamer 341 ft. in length, over all, 48 ft. 3 in. in breadth, and 24 ft. in depth, and has been built to Lloyd's highest class. The propelling machinery is of the triple-expansion type, supplied by the Central Marine Engine Works of Wm. Gray and Co., Limited, and has cylinders 24 in., 38 in., and 64 in. diameter by 42 in. stroke. Steam is generated in two large steel boilers working at a pressure of 170 lbs. per square inch. The vessel and machinery have been built under the personal superintendence of Mr. W. Birchby, the owners' superintendent. The *Easingwold* carried a full cargo of coals, and the result of the trial made in the Bay before proceeding on her voyage to Port Said was eminently satisfactory, an average speed of 9 knots bring recorded.

Lisette.—On Tuesday, September 20th, the final and loaded trials of the new steamer *Lisette* were run on the measured mile at Skelmorlie, the official trial in ballast having been run the previous week, when a distinguished party of the owners and their friends were on board. The *Lisette* is a handsome cargo steamer of dimensions:—220 ft. by 30 ft. 6 in. She is of the raised quarterdeck type, and constructed to carry a deadweight cargo of about 1,190 tons on her legal draught of 13 ft. She has been built to the order of the Goole and West Riding Steam Shipping Co., of Goole, for their extensive coasting and foreign trade, by the well-known Clyde firm of S. McKnight & Co., Limited, of Ayr. She has been fitted with powerful triple-expansion engines by Messrs. Hutson & Son, Kelvinhaugh, Glasgow. The *Lisette* has been constructed to fulfil the requirements of Lloyd's for their highest class, both in hull and machinery departments. On the official trial a speed of close upon 11 knots was attained, and on the loaded trial, with 1,160 tons deadweight on board, a speed of over 9¾ knots was obtained, in spite of the fact that the trials were run during most boisterous weather—the wind blowing half a gale. After completing her trials the vessel proceeded on her maiden voyage to Portsmouth, with a cargo of coal for Admiralty purposes. The vessel and her machinery has been superintended on behalf of the owners by Mr. Geo. H. Strong, M.I.N.A., the well known naval architect and consulting engineer, of Hull.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

THE FATAL EXPLOSION AT GLASGOW.

To the Editor of THE MARINE ENGINEER.

DEAR SIR,—With reference to the reports which have appeared in the papers on the above, if it were better known that there is another refrigerating agent, that is quite as efficient as ammonia in refrigerating effect, whilst possessing none of the dangerous properties of the latter, such an accident as the above would be rendered impossible. Ammonia, as is well known, is a blood poison, and even a small percentage in the air renders life insupportable.

This other refrigerating agent is carbonic acid gas, the chemical symbol of which is CO_2: it is the gas that is used for making all aerated water, has no smell, and the respiration of air containing even a small quantity of it, leaves no deleterious effect upon the system.

If the machines on these respective systems are properly designed, their refrigerating power is equal, and whereas one uses a noxious material, the other has been demonstrated to be, comparatively speaking, absolutely harmless. We venture to think therefore that the time has arrived for the universal adoption of this safer agent, carbonic acid gas, of which we shall be happy to supply any further information.

As regards reliability, the very large number of machines on the carbonic acid gas system that we have supplied, is, we should think, ample evidence that they are in every way as reliable as any other system.

We remain,
Yours obediently,
J. & E. HALL, LIMITED.
BERNARD GODFREY,
Managing Director.

23, St. Swithin's Lane,
London, E.C.
September 20th, 1898.

Reviews.

The Mechanical Engineer's Handy Office Companion. By Robert Edwards, M.Inst.C.E. London: Crosby Lockwood & Co. 1898.

THIS little book is obviously written by a practical man. The number of these handy books and companions is legion, and information of a very similar character is to be found in most of them. Nevertheless we think that, though the contents may be of the well-known type, there is still a niche for the painstaking work of Mr. Edwards. For he has given very great attention to the question of arrangement. Good arrangement means economy of time, and economy of time is the *raison d'etre* of all this class of work. For the engineer could always obtain the information they afford him for himself, if it were not that he looks to these to help him to save his time. Mr. Edwards has thought that the multiplicity of tables tends to undue waste of time in searching for the information needed. So he has arranged his mathematical information in what he terms General Tables in twenty-two parallel columns. Thus every function of any number or fraction which may be desired to be looked up will be found in the one place. These General Tables occupy some twenty-six pages of the book, and indeed amount to one-third of its space. Then he gives certain special tables for the conversion of measures of length, weight, capacity, &c., into their various equivalents. Here he enables us to state our own British measures in decimal equivalents with the least possible trouble. There are notes on electrical matters and memoranda on the properties of water and steam. Little tables of use to those who are considering the question of motor-cars, and general notes on the properties of the materials with which the engineer is brought into contact are also afforded. A good deal of attention is given to the question of the weight of iron of certain sizes, both in plates and in wire, and generally the selections and arrangements show that the book is the production of a man of experience and observation

The Process Year Book for 1898. Edited by William Gamble. London: Penrose & Co 1898.

THIS is another of the fascinating volumes which Messrs. Percy Lund & Co. produce for those who are delighted by the effects portrayed by the innumerable processes whereby the delicate art which a few years ago was hardly within the means of the wealthiest merchants, are now brought within easy reach of the humblest of their employes. To take as examples the work shewn in the earliest established illustrated papers of this class, we all recognise, when we notice the work which the *Illustrated London News* and *Punch* produce to-day and compare it with that which the same journals offered their admirers half a century ago, that the science of wood-cutting has immeasurably progressed of late. Though the *Daily Graphic's* up-to-date cuts cannot perhaps compare for finish and detail with pictures in the weekly papers—and that naturally enough—we have not to go back many years to find that the picture which is produced in a few hours and printed at express speed to-day is as good or better than the laborious and slow production of previous times. But the extraordinary thing about to-day's art is that there are so many processes by which accuracy and finish can be acheived at prices which bring truth and beauty within the reach of the million. Photogravure, electros, good ink, good paper, colour-printing processes, all these things reach a level which was undreamt of a few years ago. Yet Messrs. Percy Lund & Co. have so consistently made fresh improvements upon what seemed but a little while ago absolute perfection, with all their new productions, that we shall expect to see the 1899 annual making the one under review look poor. How it will be done we cannot suggest. Even they will probably not know the means till 1899 is well on its course. But—if we may judge by experience—do it they will, and those of our readers who see the volume we are now noticing will agree with us that the wise man will order next year's issue without waste of time. There is but one picture which we would venture to criticise at all adversely. And that, curiously enough, is an old-fashioned copper etching. It is entitled *Sixty Years Progress in Engineering*. It shows a full rigged sailing vessel stern on to a steamer. In the first place, unless the steamer was going at *Turbinia* speed, we doubt if the vessels could ever have got into the relative positions shown, and in the next place the masting of the steamer and the rigging of her poles is beyond anything yet dared by the most radical shipbuilder. But regard the beauty of the coloured drawing of the Old Bridge at Capel Curig, or of the unpoetical subject portrayed at page 65, and criticism is silenced most effectually.

Transactions of the Institution of Naval Architects. Vol. XI. London: Henry Sotheran & Co. 1898.

THIS volume gives us the papers and discussions of this important Society for the Spring meeting of the present year. As will be within the recollection of many of our readers, some very valuable papers were contributed to this session. Sir John Durston, the Engineer-in-chief of the Navy, detailed results of the trials of H.M.S. *Diadem*, a large and powerful cruiser of the first class, whose performances in that regard would in any case have been interesting, but which attained further importance from the fact that she is fitted with water-tube boilers of the improved Belleville type. The account which he gave of the manner in which the boilers came through these searching trials ought to make outside critics somewhat chary of finding fault in the reckless way which some members of Parliament have done, with the boilers of naval ships, simply because they were on a new plan. In the discussion which followed this paper, Mr. R. O. Allen gave some interesting information on a point which is now of considerable importance, owing to the vast number of steam engines which all modern vessels carry in addition to those which propel the ship. He told of the progress which has been made towards economy in the design of auxiliary machinery, and suggested methods in which further saving might be sought. Mr. Yarrow, too, touched on the great boiler question. There were several papers on subjects which peculiarly affect the work of the Naval architect, such as Herr Gumbel's remarks on the problem of stability in naval architecture, and Professor Hele-Shaw's contribution to our knowledge of the nature of surface resistance in water. The designer of marine engines had his attention particularly drawn to Mr. Froude's experiments with reference to twin screws, and to Mr. Hamilton's remarks on the loss of horsepower which takes place from skin friction and from wave making. Mr. Hamilton here is following out the labours of his late partner, Dr. Kirk, and is contributing valuable additions to our stores of knowledge on a very difficult point. His paper was the means of eliciting some valuable observations from Sir William White and others. Mr. Charles H. Haswell gave some historical reminiscences of early steamers in the United States, whilst at the other end of the scale, Captain Jacques discussed the fascinating problem of submarine navigation. The question of economy of time and labour seems ever present to the minds of the practical members of the Institution. Thus Herr F. Kodolitsch wrote on the subject of Rivetting by Electricity, and Mr. Duckham treated the question of handling grain cargoes by pneumatic power. Mr. Hok read a paper on the turret-deck ship, and was supported in his argument in favour of an alteration in design in this direction by Mr. Ropner, the inventor of the trunk steamer. These types were, however, rather severely handled in the discussion by Sir Raylton Dixon, who seemed to suggest that whatever other good points the designs may have, they do not surpass ships of the ordinary character in giving great deadweight capacity on small nett registered tonnage. His remarks do not seem to have been all disposed of in the reply of the author of the paper. The brief notice which is all we can give here cannot be concluded without a word in reference to the diagrams and illustrations, which are afforded in such profusion at the end of the volume, nor to the excellent editing of the able and indefatigable secretary of the Institution. There is one little suggestion, however, that we would like to make. It is this: In reporting the discussion, not only is the name of the speaker given, but his position in the society, and outside of it too, are all set out every time his name appears. As a full list of members appears in the volume, this seems needless. In one discussion, for example, Sir William White's name appears four times. Each time we were reminded that he is LL.D., F.R.S., and K.C.B., and also that he is a vice-president of the society. All this could have been found out—if there exists anyone who is unaware of Sir William's well-earned distinctions—by a reference to the list of members. When repetitions of this kind come, especially in a society where so many distinguished men take active part, these phrases become wearisome to the reader, and tend to be ridiculous. Imagine, too, where they would get, if so many-titled a personage as say H.R.H. the Prince of Wales joined in the discussion, and was interrupted a time or two.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

July 23rd, 1898.

Annan, Alex. ..	1C	London
Berry, James ..	2C	Cardiff
Brown, Jas. W.	2C	W.H'pool
Brown, Samuel	2C	Cardiff
Bryant, A. E...	2C	Cardiff
Butcher, W. H.	2C	London
Campbell, A. ..	1C	Glasgow
Chappell, Albert	1C	N.Shields
Chicken, J. S...	2C	Cardiff
Chisholm, Hugh	2C	Glasgow
Clark, Daniel J.	2C	,,
Collingridge, W.	2C	London
Cosgrove, Thos.	2C	N.Shields
Crawford, E. W.	2C	London
Crosthwaite, H.	2C	Glasgow
Dobson, Thos...	1C	,,
Dolbie, Hugh ..	2C	,,
Dossett, J. H...	2C	W.H'pool
Dove, Robt.....	1C	,,
Eckford, P. G.	2C	S'h'mpton
Fairbairn, C. J.	2C	Liverpool
Fleet, H. A....	2C	N.Shields
Fleming, W. Y.	1C	Glasgow
Gardner, J. L.	2C	N.Shields
Graham, A. P.	1C	W.H'pool
Henderson, W.	1C	,,
Hetherington, A	2C	N.Shields
Hutchinson, A.	2C	W.H'pool
Jamieson, Alex.	1C	Glasgow
Johnston, Wm.	2C	Dundee
Kyd, George ..	2C	Glasgow
Mahamed, S. M.	2C	,,
Marsh, Arthur..	2C	N.Shields
M'Bryde, R. M'N.	2C	London
M'Clure, Geo...	1C	Glasgow
M'Donald, J. P.	2C	,,
M'Dowall, Wm.	1C	,,
Moussouris, G.	1C	Cardiff
Nish, Jno.	2C	Liverpool
Owen, Henry P.	2C	,,
Petty, Percy ..	2C	London
Rae, James D.	1C	N.Shields
Reid, Robt.	2C	Liverpool
Robertson, J. ..	2C	Glasgow
Robson. George	2C	N.Shields
Rutherford, Jno.	2C	Glasgow
Shearer, J.	2C	Liverpool
Silver, Robt. B.	2C	London
Trusson, Chas.	2C	W.H'pool
Vint, Jno.......	2C	Glasgow
Ward, W. P. ..	2C	Liverpool
Watson, Wm...	1C	Glasgow
Watt, Alexr. ..	2C	Liverpool
Will, Alex.	2C	Dundee
Williams, J. E.	2C	Cardiff
Williams, P. H.	2C	,,

July 30th, 1898.

Adams, Geo. S.	1C	Aberdeen
Ashley, Chas. E.	2C	Hull
Barkess, Richd.	1C	S'nd'rl'nd
Barnes, Wm. T.	1C	London
Baty, Jno. A...	1C	S'nd'rl'nd
Bulow, Viggo, C.	1C	London
Clubley, Aug. ..	1C	Hull
Cowan, David,..	2C	London
Crosbie, James	1C	Liverpool
Firth, Wm.....	2C	N.Shields
Fisher, Thos. H.	1C	Liverpool
Frus, Jno. A. ..	1C	Hull
Gall, John	1C	Liverpool
Gillespie, Wm.	2C	London
Graham, L. L.	1C	Liverpool
Irwin, Thos. T.	2C	N.Shields
Jack, Joseph ..	1C	Aberdeen
Jones, Geo. V.	2C	London
Laws, Wm. P...	2C	Hull
Manson, J. W.	1C	S'nd'rl'nd
Mason, Joseph	1C	,,
Mell, L. P.	1C	London
M'Neill, A. W.	1C	,,
Murray, A. W.	1C	S'nd'rl'nd
Penny, Wm. ..	2C	Aberdeen
Scott, Ernest ..	1C	Bristol
Shields, Geo. ..	1C	London
Smith, Chas. S.	2C	Liverpool
Tinn, Arthur ..	2C	N.Shields
Tomkins, W. H.	1C	,,
Turnbull, J. S.	1C	S'nd'rl'nd

August 6th, 1898.

Bruce, J. Wm.	2C	Liverpool
Chidley, Arthur	1C	London
Cornish, R. H...	1C	Cardiff
Driver, Reginald	2C	London
Evans, Joseph..	2C	Liverpool
Finning, Geo...	2C	Glasgow
Frost, Thos.....	1C	N.Shields
Galbraith, Wm.	1C	Liverpool
Gardner, J. S...	1C	Glasgow
Garratt, E. A...	1C	London
Gedge, Alfred ..	1C	Cardiff
Good, Wm.....	1C	Glasgow
Hinde, Wm. D.	1C	S'hmpton
Horend, Wm. R.	2C	N.Shields
Hutchinson, T.	1C	,,
Johnston, Ben.	1C	Liverpool
Kelt, Peter McL.	2C	London
Lees, Herbert ..	1C	Cardiff
Lewis, G. D. H.	2C	Liverpool
Macdonald, N.	2C	N.Shields
M'Naughton, M.	2C	Glasgow
Moffatt, C. W.	2C	N.Shields
Ohki, Toskio ..	2C	,,
Parr, Tom D...	1C	Cardiff
Payne, C. E. E.	2C	London
Porter, H. G. ..	1C	,,
Roberts, R. H.	2C	N.Shields
Robinson, P. B.	1C	London
Rutherford, R.	1C	N.Shields
Smith, Wm. ..	1C	Cardiff
Wallace, G. G.	1C	Glasgow
Weller, H. W...	1C	London
Whiteford, J. E.	1C	,,
Wilson, E. J. ..	2C	N.Shields

August 13th, 1898.

Abey, Wm.	1C	N.Shields
Argall, Alfrd. C.	2C	,,
Bell, Robert ...	1C	Greenock
Black, John	2C	Leith
Butterworth, F.	2C	London
Elliot, F. W. ...	2C	N.Shields
Flanagan, M. ..	1C	Liverpool
Frier, Wm. F...	2C	N.Shields
Gordon, Alexr.	2C	Greenock
Gornall, S. B. ...	2C	Leith
Graham, J. W.	1C	Greenock
Green, Peter..	2C	London
Hine, John M'L.	1C	Leith
Hogg, James ..	1C	,,
Jones, Frdk. R.	1C	Liverpool
Kell, M. E.	1C	N.Shields
Linton, Wm. ..	2C	Leith
Macdonald, R...	2C	,,
McConnell, R. H.	2C	Liverpool
Middlemass, R.	2C	Greenock
Monro, Burnett	2C	Leith
Morrison, W. A.	2C	Hull
Newton, R. D...	2C	Greenock
Oliver, R. J. ..	1C	N.Shields
Reaveley, James	1C	,,
Reid, Alexr.....	1C	Leith
Robinson, C. P.	2C	Hull
Robinson, Cyrus	1C	N.Shields
Shaddick, J. W.	2C	Liverpool
Sharpe, Robert	2C	N.Shields
Stewart, D.....	1C	Greenock
Stirling John ..	1C	London
Thomson James	1C	Greenock
Walker, L. A....	1C	Leith
Witten, Geo. ..	1C	N.Shields

August 20th, 1898.

Binning, Geo. ..	2C	N.Shields
Bowen, Jas. D..	2C	Cardiff
Campbell, H. D.	2C	Glasgow
Cocayne, Henry	2C	Liverpool
Corney, Jno. ..	2C	W.H'pool
Darling, Wm...	1C	Glasgow
Edwards, D. H.	2C	Cardiff
Farrell, Hy. G.	2C	,,
Ford, Frdk. G.	2C	London
Gregory, J. G.	2C	Plymouth

The Marine Engineer.

LONDON, NOVEMBER 1, 1898.

THE North-East Coast Institution of Engineers and Shipbuilders have commenced their fifteenth session on October 14th, and, as is usual, have submitted a report and statement of the last year's business and progress upon which we must congratulate the Institution. The number of members of all denominations now enrolled have exceeded 1,000, and the healthy conditions of their finances is evidenced by the increase of the bank balance carried over at the end of the session, compared with what they took over at the commencement of that session. The report of work done during the session includes a list of eight excellent papers upon shipbuilding and engineering, and even in the graduate section there seems to have been no lack of interesting papers and debates, which is much to the credit of the graduates, and speaks well as to the training of the rising generation. The new session is under the Presidency of Sir Benjamin C. Browne, D.C.L., who delivered his inaugural address at Newcastle-on-Tyne. The choice of subject by the President is characterized by considerable boldness, as he chose to deal with that most knotty subject, the relation of engineering and shipbuilding employers to their workmen. We, however, fully concur with him that consideration of the subject with the candour and fairness of the author to both sides of the question is most valuable to any members of a manufacturers' institution; for however well a business may be conducted technically, the balance sheet will be largely affected as to its profit and loss account by the good management, and, as far as lies in the employer's power, the contentment of the workpeople. It would probably be well if all bodies of employers, and of workpeople too, were to give open expression to their opinion as to in what manner the interests of workpeople and employers are identical, and on what basis such interests can be discussed without bitterness and with a probability of good resulting to both. Sir Benjamin at once strikes a key-note for cordiality on both sides in that he expresses his opinion that employers have a distinct advantage in dealing with masses of workpeople through the heads of a recognized organization such as a trades union, if such heads are competent members with an actual knowledge of the manufacturing conditions and the trade, than if the men were an unorganized body. He sees the tendency under the latter circumstances for the men under sudden emotion or indignation, to suddenly mass together, and probably to be led away by any chance leader of violence and of no experience, whereas the leaders of the Trade Union have at least experience of former disputes, and should be men of some knowledge. Above all, the recognized authority of such leaders, not merely spokesmen of the movement, gives a definite body with whom to negotiate, and who can enforce respect for their decision. Where the views of workpeople and employers are absolutely irreconcilable a trade conflict or strike would be inevitable, with or without unions. A fight fairly fought and unsuccessful to the workpeople, is more likely to be a matter of record and to permanently carry its lesson with it under the organization of the Trade Unions rather than if the workpeople were a chaotic mass without representatives or leaders. Sir Benjamin also goes so far as to say that there are a class of demands by the workmen, which, though in the first instance instituted for their own benefit, in the long run are equally for the benefit, or not injurious to, the employer, such, for instance, as the movement for weekly wages and for the restriction within a reasonable limit of overtime. It is probable that overtime long continued reacts to the disadvantage of the employer in less work turned out in a given time than with the energy of ordinary working hours. Sir Benjamin, however, also recognizes that there are demands of workmen which may require a greater or less sacrifice by the employer, but which they can afford to give. And further, that there are those which may be beneficial to the workmen, but which the employer cannot afford to give, either on account of his own interests, or on account of the trade. Finally Sir Benjamin would class certain demands as not even really beneficial to the workmen themselves. Of these latter, the President considered the demand for the eight hours day to be one. The essence, however, of the last great strike in the engineering trade was, in Sir Benjamin's opinion, the question of a struggle for the management of the works, which so long as the workmen have no financial interest in the capital and profits must lie entirely with the employers. The President, however, considers Mr. Livesey's experiment in the South Metropolitan Gas Co. in inducing the workmen to become shareholders, a most valuable one, as he has already induced his workmen to invest £50,000 by their savings in the shares of the company. In such a case the workmen are bound to consider both sides of the question in any demand they may make upon that which they may then look on as partly their own business, and it is in this direction that Sir Benjamin would be glad to see the interests of workpeople and employers more generally coalesced and identified.

THE Institute of Marine Engineers marked its 10th anniversary in the usual way, with a dinner at the King's Hall of the Holborn Restaurant, with the President, Dr. John Inglis, in the chair, supported by a company of about 250, including a considerable number of distinguished visitors. After the usual loyal toast, Mr. Robert Caird, in proposing the Navy, Army, and Reserve forces, pointed out that marine engineers had a personal and direct interest in the present determination of the Government, supported by the country, to establish and maintain a navy equal to that of any two powers, and their interest also extended to the increase of the mercantile navy, which could only exist under the protection of an invincible navy. Marine engineers were a help and a check to the Administration in their criticisms of the means proposed to attain that ideal. The Spanish-American War had shown the lamentable danger of want of administrative polity. But confidence in the technical department of our own Government was unbounded, and the Army had latterly been well-tried. In reply for the Army and Navy, Mr. J. A. Smith, R.N., in the absence of his chief, Sir John Durston, considered that we were living in stirring times, and must not yet hang up our swords and spears. The growth of the Navy had been marvellous in the last ten or twelve years. New ships were still being substituted for old, and in comparison with its competitors our Navy was stronger than ever. Mr. G. W. Manuel, R.N.R., replying for the Reserve Forces, considered that this second line of defence, when called upon, would prove able and efficient. The engineering branch of the Reserve Force was still a small body, and not in an altogether enviable position, with no pay and no special uniform. The number of engineers training in dockyards was quite inadequate. Late wars had shown the value of assistance from the merchant service, and with better help from Government the merchant service might take a far better part than at present. The toast of the evening—The Institute of Marine Engineers—was proposed by Mr. A. Boyle, who said he desired to recognize the importance of the marine engineer to the British Empire. In view of the increasing keenness of competition by foreign countries in the shipbuilding and engineering industries, it was obligatory on all to help to maintain the position of the country, and no more effective step in this way could be taken than by cordial support of the Institute of Marine Engineers, disseminating as it does the practical experience of marine engineers amongst their profession and to the public generally. The success of the Institute had been surprising, numbering now 1,031 members. The publication of the valuable papers and discussions enriched the literature of engineering and members became better acquainted.

The position of the nation as holding a foremost
for the production of marine engineers was evid
by the fact that the engineers of foreign navies
chiefly British. He trusted the present gener
aided by such institutes as that of the M
Engineers, would continue to hold their place am
the nations. Mr. James Adamson, in acknowle
the honour done to the Institute, and the cordi
dorsement by the members present of the policy
ried out by the founders and successive office-be
thought the position of the marine engineer
become more responsible year by year. The add
to engine-room appliances, and the introduction
plant for many purposes, have added to the labo
engineers, and it is to their credit that they ha
well met the increased demand upon them, and
willing to prepare for further development by th
of the Institute, one of whose aims is to enco
progressive training and advancement. Non-
bers were appealed to to come over and help the
tute, and all that may aid the advantage and eco
of machinery. The marine engineer, both merc
and naval, can assist largely in aiding the shipo
and the nation to outstrip all competitors, eith
trade or in war. To encourage this such incenti
will cause the nation to give her best to the en
room should be afforded, and full representation
profession should be afforded, on the Admiralty B
Captain A. J. G. Chalmers, in proposing the
of Ships' Colonies and Commerce, remarked
the present truism of the apparent paradox that
seas but join the nations they divide." In th
days the navigators with the "white wings" did
utmost to justify the poet's boast, but it was not
the marine engineer appeared upon the scene th
prediction was adequately fulfilled. The Colonie
multiplied our ships, and the Colonies and
together had produced the commerce. The S
man was the pioneer of commerce, the rat the ha
on, and the Newcastle grindstone the most ubiqu
product of commerce that the world had ever
duced. Mr. T. L. Dewitt, in response, drew att
to the keen rivalry of America, and, thoug
disappearance of the "white wings" was
regretted from a sentimental point of view,
to steam and the marine engineers that shipowne
merchants must look to maintain the pre-emine
country. We must not, however, neglect necessar
cautions and efforts to do so, and though the Co
cling to the mother country they must still go
cheapest markets. A difference of a few pence p
would send an order for rails to Belgium, and
might even be shipped in foreign bottoms; it
only by working and holding together that suc
agreeable results could be avoided. Technical

tion might do much to assist this, and Sir Wm. White had been doing noble service in this direction in connection with the Shipwrights' Company. Sir Wm. White rose amid acclamation to propose the President and congratulated the Institution upon its succession of presidents, modestly excepting himself. The Scotch element was very strong amongst their presidents, and it would perhaps be difficult to make a better choice. Dr. Inglis might claim to be both a marine engineer and a shipbuilder, acquainted with the theory and practice of the profession and in full sympathy with the members. Dr. Inglis, in expressing his thanks for the kind terms of the toast, was glad to think that the Chief Constructor was in no danger of undervaluing the services of the marine engineer. It had been said in an after dinner address that had there been no steamers the marine engineer would not have existed. The president was not so sure of that, but he could say that if there were no marine engineers there would be no steamers. What Act of Parliament could compare in its effects upon the people with the cheap and rapid transport, mainly due to the marine engineer. The position was honourable to anyone, and although he had entered with diffidence upon his duties, he would promise to do his best for the welfare of the Institution. The Hon. J. C. Burns gave the toast of the Houses of Parliament, which should appeal to the members as trade depended much upon their action. Many laws were passed which were, at any rate, well intended, though sometimes onerous in effect. There was as much gratitude due to the Houses of Parliament for the Bills they had thrown out as for the Acts they had passed. Mr. Fortescue Flannery, M.P., in response, felt the nation, as compared with the legislative bodies of foreign countries, had reason to be proud of its Houses of Parliament. In both Houses distinguished engineers and scientists were enrolled and honoured. Acts of Parliament had, however, not done so much for civilization as the profession of which they were proud to be members. Much was being done to improve the status of the engineers in the Navy, and any remaining grievance would be soon removed. He would like to see a scheme brought forward and perfected to improve the reserve of British seamen in the mercantile marine as essentially necessary in the stress of war. Mr. B. Martell wound up the toasts in graceful fashion by proposing "The Visitors and Kindred Institutions," remarking on the excellent work towards international friendship lately effected by the Institution of Naval Architects, and the further steps that might be taken in the same direction, and the reply by Professor A. Barr, on behalf of the Scottish Institution, and Mr. G. Holmes, on behalf of the Institution of Naval Architects, brought a most enjoyable meeeting to a happy conclusion.

SHIPBUILDING IN GERMANY.

(From our own Correspondent.)

SHIPBUILDING in Germany is at present in a very flourishing state, and has made great advances of late years. There is a distinct and growing tendency on the part of German owners to support the home industry, in spite of the higher prices, and there are cases in which they even go so far as to pay the difference in price to induce builders to use German material. Although the prices attained are often higher than those asked by British builders, the principle yards are fully employed, owners finding it almost impossible to place orders with a reasonably short time of delivery. Another sign of the prosperity enjoyed is that many of the yards have been paying good dividends, for instance the Flensburg Shipbuilding Co. have declared 13 per cent. for the last year's working, compared with 8 per cent. for the year before. They have payed on an average 10½ per cent. per year for a period of 20 years, the lowest during that time being 4 per cent, and the highest 19 per cent. The yard has been busy during the whole of the year, the work turned out being an aggregate of 29,357 gross reg. tonnage, the engine department having an output of 12,620 I.H.P. On the average there have been 1,800 men employed by the Company. The yard has at present 37,000 gross reg. tons on order, the engines will also be built by the firm.

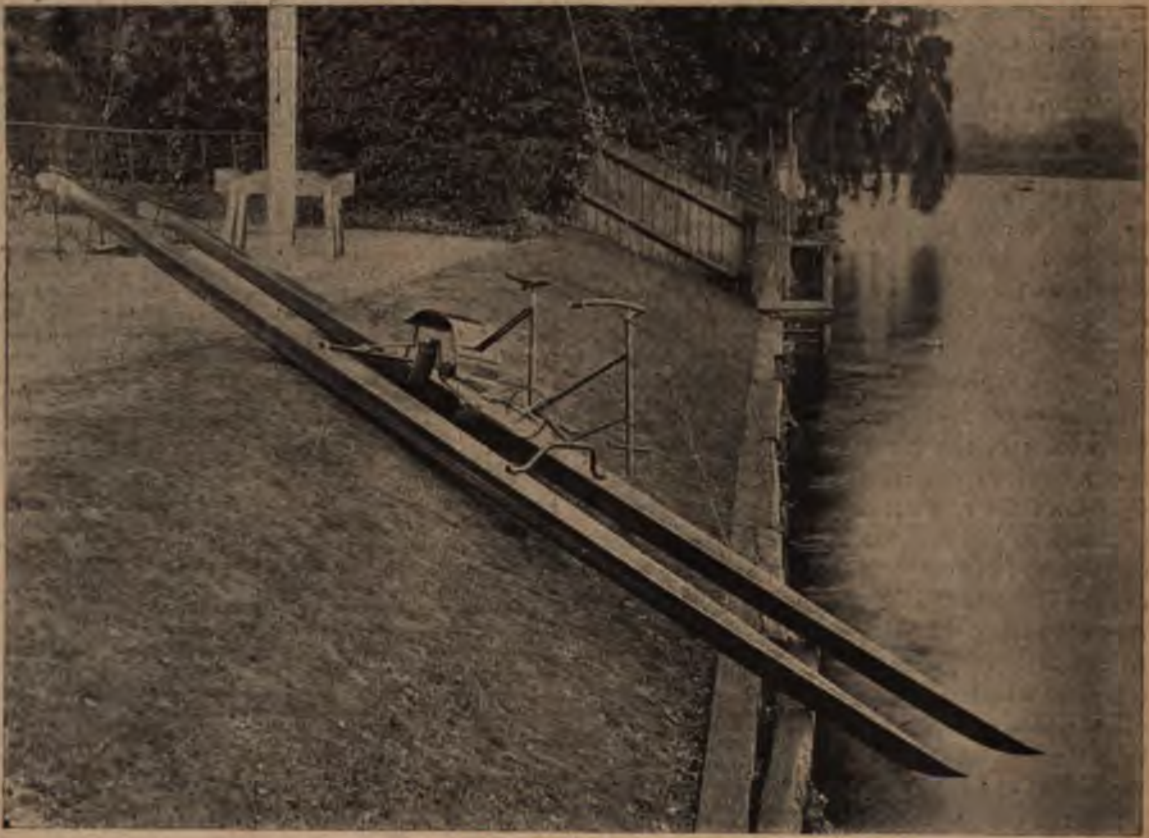
The "Flensburg Shipbuilding Co." has bought a large piece of ground adjoining the present yard, which is intended for the building of ships of the largest dimensions.

Other yards have also been doing well in this respect. The Bremer Vulcan Co. and Reiherstieg Shipbuilding Co., both gave 10 per cent., the Actien Gesellschaft Weser 9 per cent., and Messrs. Blohm & Voss, and the Oder works both 5 per cent. for their last year's workings. This prosperity and growth is going on greatly at the expense of British yards. Previously Germany was one of our best customers, and the returns show that the amount of tonnnage purchased is yearly decreasing as the home industry rises. The advantages of cheap ground and labour, less harassed by strikes, are items difficult to compete with especially as is generally the case, first-class machinery are used. Surely if this large trade cannot be retained by British builders, it is advisable that British capital should secure its share of it by erecting yards on German ground. There have been rumours of British builders proposing to do so often, but nothing definite has come of them. Lately however, a well-known firm of winch and windlass builders, have purchased ground near Hamburg, for the erection of an engine shop, and there is an attempt being made to raise capital for starting a shipyard at a very suitable place in one of the German North Sea ports. We trust that those companies may be successful, and be well remunerated for their endeavour to retain for British capital its share of the profits arising from German prosperity.

A NEW PROPELLING DEVICE.

THE oar, or its equivalent, has up to the present maintained the premier position among propelling devices for boats, as being the most efficient means known for transforming the energy of the muscles of the human being into movement of the boat relative to the water. Many attempts have been made with more or less success for years past to adapt screw propellers and paddle wheels with means for operation by human power. We have now the pleasure of illustrating and describing a new form of propeller which seems to be a departure from any existent method. In the adjoining illustrations Fig. 1 represents a boat on the bank fitted with the new propelling device, which is the invention of Mr. John Forrest Walters, of Clyde House, Twickenham. Fig. 2 shows the same boat as it is travelling through the water. The characteristic feature about the propelling device is that it is substantially the canoe paddle of the primitive savage, with the addition of means for mechanical operation by the feet.

In this case the boat consists of double bodies between which is arranged the propelling device. Mounted upon the bodies is what is practically the frame of a safety bicycle, having a pedal axle provided with cranks and pedals and a large sprocket wheel for the chain, which latter is taken round a small sprocket wheel mounted on an axle supported in the back members of the frame. This latter axle is provided with crank arms which pivotally carry at their ends the paddles, *i.e.*, one paddle to each crank. Each paddle is rigidly fastened to an arm which is adapted to slide through a rocking guide block supported upon a transverse shaft. This arm controls the angular movement of the paddle about its pivot on the end of the crank, in the same manner that the arm on the float of a feathering paddle-wheel controls the float by means of the rotary feathering gear. In the present device, however, the feathering obtained is probably more efficient than that of the paddle wheel by reason of the controlling point through which the arm passes being a fixed point instead of a moving one. We understand that experiment has shown that the new device has much less slip than either the paddle or the screw. It has been found, we understand, also, that a speed of 12 miles an hour over the water has been obtained in the boat illustrated, by one man driving the propeller.



A New Propelling Device. Fig. 1.

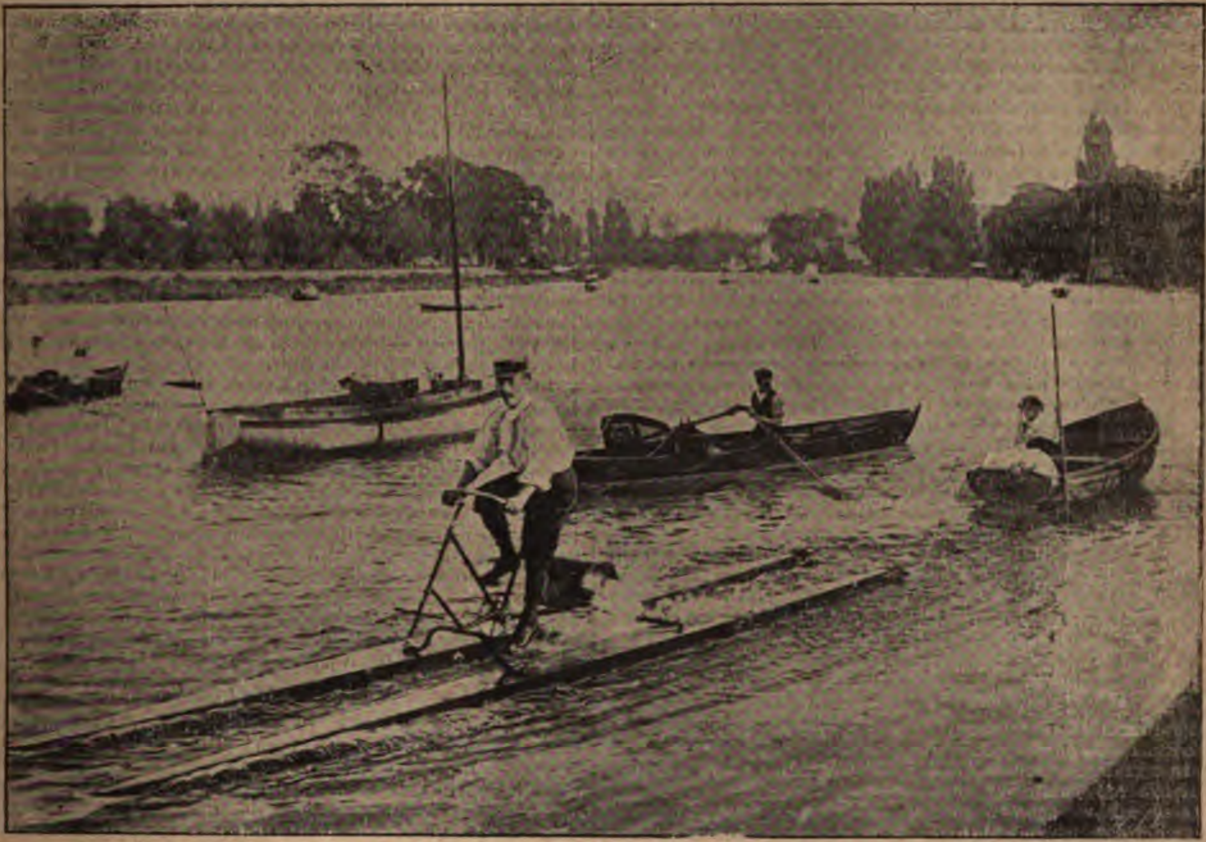
There is probably a good deal more in this device than appears on the surface, and we shall look forward to the results obtained from practical trials on a systematic basis of experiment as soon as they are obtainable.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

The "Mohegan" Mystery.

All other topics have, during the past month, sunk into insignificance in comparison with the case of the loss of the Atlantic Transport Company's steamship *Mohegan*, on the Manacles at 7.30 p.m. on the 14th of October. The readers of these Notes have already been told that the *Mohegan* was one of the five steamships taken over by the Atlantic Transport Company from the Wilson-Furness-Leyland Line, when the latter company arranged to give these ships and the goodwill of the New York trade to the older company. The *Mohegan*, under the name of *Cleopatra*, was launched by Messrs. Earles, of Hull, on the 7th April of the present year. In every respect she was a sister to the four other vessels which survive her. The arrangements for transfer were effected before she was completed, and she therefore never ran for the original owners. When she came out in July she made her first and only complete voyage across the Atlantic for the Transport Company. On this occasion there was trouble with her boilers, and she made a singularly bad run, the passage extending to about three weeks. On her return she had a thorough and protracted overhaul. She started on her second trip from London on Thursday the 13th October under Captain Richard Griffiths, the commodore of her owner's line, with a crew of ninety-six persons, one stowaway, six cattlemen, and fifty-three passengers—all of the latter being in the saloon. She passed Prawle Point at 2.30 p.m. next day and signalled "all well." The next thing known is that the coast guard on the Cornish heights saw the vessel making for danger, and tried, but in vain, to warn her of her peril. On she went and struck at full speed. She quickly listed over to port, and sank in from fifteen to twenty minutes. In that brief interval four boats were got out, but the somewhat heavy sea, though it was nothing for a liner, was—especially in the vicinity of partly submerged rocks—a very trying matter for ship's boats. The behaviour of all on board after the collision seems to have been worthy of the best traditions of the merchant service, and of the middle-class British and Americans, from whom the passengers were drawn. No panic, no thought of self, everyone quietly doing their best, though hope seemed faint. The list, which became more and more emphasized as the ship got deeper in the water, prevented the launching of any more boats, even had time allowed, and in the event but fifty of those on board reached safety. The whole of the navigating officers are amongst the lost, and the only engineers saved are curiously enough some of these who were on watch. From them we learn that the suggestion that she drifted ashore owing to a breakdown of her engines—she had but a single screw—are unfounded. It is also certain that there was no fog. It would be premature to say more as to the causes of the disaster, till after the termination of the enquiry. I may mention that Mr. Edward Lemington, who was chief steward of the *Mohegan*, and who is one of the victims of the catastrophe, was one of the crew of the same company's s.s. *Missouri*, when she effected the famous rescue of the *Danmark's* passengers and crew. To that feat I shall refer again in a moment. But it is sufficient to say here that in recognition of his services on that occasion Mr. Lemington received many public presentations.



A NEW PROPELLING DEVICE. FIG. 2.

A Defunct Line.

The month has seen the end of a well-known Continental line of Transatlantic steamers. I refer to the Thingvalla line, which plied between Copenhagen and New York. The British public knows it best from the fact that it was the owner of the steamship *Danmark*, whose foundering in mid-ocean some years ago gave Captain Murrell, of the Atlantic Transport Company's s.s. *Missouri*, the opportunity of effecting the rescue of a large number of helpless passengers, and of showing his resource and daring in emergency. The public recognition of Captain Murrell's exploit was warm in the extreme. Since that time the incident has been recalled by the sad ending of a promising nautical career, owing to Captain Murrell's enforced retirement from the sea on account of the failure of his eyesight.

The United Steamship Company of Copenhagen has taken over the old Thingvalla Line. It has not for some time been in a very flourishing condition. Its finest and largest boat was the *Amerika*, a vessel well-known under her old name of *Celtic* to most of those who follow the fortunes of the Fleets of the Mail Lines. The *Celtic* was the one of the third pair of sisters which the White Star Line constructed for the New York trade. Her fellow was the *Adriatic*, of whom I shall speak in a moment. These twins were a trifle longer and more powerful than the first quartet. Messrs. George Forrester & Co. constructed the engines of the *Celtic*, and, though she was one of the most comfortable and best sea boats that ever crossed the Alantic, she never had quite the speed of the *Adriatic*, which was engined by Messrs. Maudslay's Sons & Field. The *Celtic* will be chiefly remembered from her prolonged voyage to the eastward under Captain Gleadell in the days when the vessels of the line were carrying the heavy yards of their original rig. A couple of hundred miles outside Sandy Hook the vessel broke her shaft, and after twelve days' struggle to get back to New York in the teeth of heavy westerly weather, it was determined that it would be advisable to go on. Go on Captain Gleadell did, and though she was out over a month he brought his ship across without assistance, save such as was given by the company's steamer *Britannic* off the Irish coast. The United Company does not take over the historic old ship. She is sold to French owners, and will be broken up at Brest.

Her Swifter Sister,

the *Adriatic*, was at one time the holder of the Atlantic record. She has been, however, very little before the public lately. For an occasional mid-season voyage, when, as a reserve ship of the line she relieved the regular boats during their longer overhaul, has been all she has done. The *Cymric*, as we have seen in previous notes, has now shown herself a fast and popular ship, and, as she is now making her second trip with mails, the *Adriatic's* place is filled. She is accordingly discarded, and has been sold out of the fleet. The *Cymric*, it is understood, has become so popular with the travelling public that it has become necessary to increase her stateroom accommodation very considerably.

Marching Backwards.

The P. & O. Company have made several announcements during the past month. Its movements do not, however, seem altogether calculated to do much honour to the line which boasts itself as Premier British Company. In the first place, it has ordered from Messrs. Caird & Company, of Greenock, what is described as a "magnificent mail and passenger steamer," destined to be a repeat in every respect of the company's s.s. *Arabia*. I presume in fact that the new ship is intended to replace the *China*. The directors may well be excused for neglecting to dot *that i*. But what does seem a thousand pities is that the single screw *Arabia* is to be so faithfully copied, and that the experience they have had with the *Osiris* and her sister, and with their other twin-screw vessels in the cargo service is still insufficient to teach them that passengers and mails ought not, at the end of the nineteenth century, to be packed in single screw steamers, where the failure of a shaft may mean indefinite delay. Then there is another move. Three steamships have been purchased second-hand. Three fine steamers they were when they were in their former owners' fleet. They were there called the *Branksome Hall*, the *Locksley Hall*, and the *Rufford Hall*. Each is of just under four thousand tons gross register. Their length is 380 ft., and they have triple expansion engines. They were built to Lloyd's highest class by Messrs. Palmer & Co., of Jarrow, in 1888. When they sailed for the Hall Line of Liverpool, they were ships of which their owners were justly proud. But whether second-hand vessels ten years old are quite the right thing for P. & O. to buy to reinforce their fleet is a matter of opinion. Many shipowners of standing assert that nowadays a vessel when ten years old is obsolete, and has lost her value as a dividend earning portion of a fleet.

Before I leave P. & O. there is another matter I would wish to notice. The *Osiris*, one of the new twin-screw steamers recently built for the Brindisi-Port Said service, has made a very fast passage from Italy to Egypt. She left Brindisi on the 9th October, and to quote the words of the communication to the Press, "steamed the whole distance of nearly a thousand miles in 46 hours and 49 minutes, which gives an average speed of over 20 knots." The vagueness of the distance given, "nearly 1,000 miles," awakens a little suspicion. A vessel running at 20 knots for the time named would do about 935 nautical miles. A vessel running a 1,000 miles in the time named would make a speed of about 21·4 knots. This is a very considerable difference, and if the *Osiris* did achieve this latter speed, surely we should have been told of this, and not of a speed nearly a knot and a half lower. The whole statement is obviously loose and inaccurate. The account goes on to say, as is perfectly true, that "the *Osiris* is a vessel of about 2,500 tons displacement, and for a vessel of her size this sustained speed has not been equalled." It is a grand performance truly, and one of which builders and owners alike may be proud. The Laird-built Holyhead boats are, I believe, larger than these vessels, and though their speed is considerably higher, their period of sustained effort is but one-fifteenth of the time taken to cross the Mediterranean. Further and accurate particulars of this wonderful performance by the *Osiris* would be most acceptable.

Messrs. C. W. Kellock & Company

have the usual large selection of steamships in their monthly list. As fast as they clear a few names off by sales other vessels crowd in to take the vacant places. I notice that the list now comes out in a highly artistic illustrated cover which makes it an acceptable addition to the office table.

The Milwaukee

whose highly precarious condition was remarked in the last issue of these notes was partly salved at the beginning of October. A very remarkable operation it was. Finding that her bows were wedged into the clefts of the rocks, and that there was a very high and long rock in No. 2 hold it was a question as to what could be done. Two alternatives presented themselves. The one was that of platforming the hold and blasting the rocks,—an operation, which, as the experience of the P. & O. *China* shows, involves months of work. Against this suggestion were the facts that the time of year did not promise long continued fine weather, and that every tide threatened to break the vessel up owing to the leverage of her floating after end. The other possible alternative open to the salvors was the cutting the ship in two and salving merely one part of her. This course was adopted. Foward of the machinery bulkhead she was cut by repeated explosions of dynamite fixed in position by divers. Even this severing was a long and tedious operation. For, apart from the skin plating of a very beamy ship, and the keel of a very big one, there were ballast-tank tops and three decks to be disintegrated. The work commenced at the bottom, and was successfully, and without any hitch, completed. But a difficulty arose in an unexpected way. There was a door in the bulkhead upon which all reliance had to be barred, and, though the large plane surface of this safety appliance stood the test admirably, the door (as such doors do) failed at the critical moment. It only followed the precedent of doors in the Cunarder *Oregon* and the New Zealand *Mataura*. But its failure did not as in their case involve the loss of the ship. If the salvors had been less resourceful or if they had had less time or less fewer appliances, it might have done so. But after three days delay they succeeded in building a coffer dam inside the weak spot, and then the most valuable part of the *Milwaukee* was towed triumphantly into the Tyne and docked. She will need a new bow building, of course.

For the fore part went to pieces on the 17th October, and showed how little a margin the salvors had to work upon. But her machinery and boilers must be in good condition. For on her voyage south she was able to use her own steam, and to drive her engines in relief of the tugs.

In reference to this ship I must make an apology to the builders of the vessel's engines. In my last month's notes I spoke of her former breakdown, and stated that this disablement was due to the fracture of a shaft. My attention has been called to the matter, and I have looked up the contemporary accounts. I find that I was quite wrong in relying on my memory of the case. The shaft never gave any trouble. The disablement arose from the "total collapse of the air pump chamber." I have much pleasure in being put right on the point. For if these notes are not accurate they are, to my mind, useless. But all the same the first trip of the *Milwaukee* was a very unlucky one. For my statement that she was completely disabled is not controverted, and from whatever cause that disablement arose it was equally unfortunate and expensive.

The Canadian Mail Contract

is again changing hands. The Peterson-Tate contract being entirely dead, a new arrangement is made provisionally with the Allan Line. Thus the Beaver Line, which did its best to fulfil its undertaking when the Canadian Government could get no one else to accept its conditions, is, after a very brief service, thrown over. This seems neither justice nor policy. It is very hard on Messrs. McIver, who have acquired two fine steamers for the mail service in the *Gallia* and the *Tongariro*, that they should be left in this way, and the whole episode is not such as will tempt any shipowners of experience to put 20-knot mail steamers on to the station. For they will be fully aware that no reliance can be placed on a continuation to them of any Government inducements, and they must adapt the vessels they employ, not to the requirements of the mail service or the ambitions of the Government, but to the practical demands of the passenger and cargo services. In this connection it may be noticed that Messrs. Workman, Clark & Co., have launched the first of the new vessels which Messrs. Allan are building for their mail line. The vessel is fully described elsewhere. But it is noticeable that she is classed with the British Corporation, a body whose classification seems to be now satisfactory to some very important shipowners.

The American Line

resumes its service from Southampton on the 5th November, when the s.s. *S. Louis* recommences the weekly service of twin-screw mail steamers. This vessel arrived at Southampton on the

THE NEW YORK PUBLIC LIBRARY LENOX AND TILDEN FOUNDATIONS

19th October, and was followed a week later by her sister the *S. Paul*. But, as there are no proper facilities on the other side for docking these big ships, they had to complete their overhaul after their employment in Government service in the Prince of Wales graving dock. For the present the *New York* is held in reserve at the Western end of the Line, the *Paris* only following the two saints to maintain the sailings.

It has been stated by a usually reliable correspondent that the United States Government paid the owners of these ships the sum of £295,000 for their charter. This ought to be satisfactory to the American Line, as it works out at nearly £600 per day per vessel. It must certainly be so to the Navy Department. For the vessels proved themselves invaluable, and the sum, large as it is, is a trifling one when one remembers the value of the vessels and the expense of their up-keep. The Navy Department has no expense in connection with them—save its retaining fee—except at such times as it is actually making use of them, and yet it knows that it can always rely on having them at the shortest notice.

The Vicissitudes of Shipmasters

seem very remarkable. On the 10th October, an inquest was held on a labourer who was accidentally killed at the docks. It was stated by the widow that the deceased, who was 57 years of age, had at one time been a captain in the Cunard service, but had gradually gone down in the world till he had reached the ranks of the dockers, and had remained there for the last five years of his life. I must admit that I do not remember any such name as this poor man's in the list of Cunard captains. But there is nothing inherently improbable in the story. A misfortune to his ship, even if he be not to blame for it, generally drives a shipmaster out of the fleet in which he is serving, and, if he has more than one disaster, he soon gets a reputation as unlucky. Then his career afloat is over. Shipmasters are not adapted for a shore life, and the downward pace soon quickens. In this respect the Marine Engineer is far better off. Unless the accident which casts the ship away be actually the engineer's fault (in which case he may very legitimately expect dismissal) a catastrophe does not cost him his employment. Even if the circumstance be such that he is compelled to seek a living ashore, he has plenty of opportunities of finding a congenial post in a fitting shop, or as foreman of the engineering department in a factory. The engineer too, knows the value of combination—as the success of the Marine Engineers' Institute shews,—and his profession has the strength of the faggot. The shipmaster shuns his society, because he thinks "his employer might not like it," and, according being individually but a single stick, is easily broken across the knee of any one who wishes to take advantage of him.

The Cape Lines.

Already the *Braemar Castle*, the new intermediate steamer of the Castle line, is back from her maiden trip, on which, I understand, she has proved herself a fast and comfortable boat, and fully justified the high hopes that were formed of her. I may mention that in the brief reference to her machinery which appeared here when she sailed on her maiden voyage there was a remark which needs amendment. The feed-heaters with which she is supplied are those of Messrs. Caird & Rayner.

The Union Line is already returning to its old love, and has gone back to Lisbon as a port of call. Once a month this line is now despatching an extra steamer to ports as far up the East African coast as Beira. These vessels will renew the call at Lisbon. The *Spartan*, sailing on the 12th October, was the first steamer to put in at the Portuguese capital, and she is to be followed a month later by the twin-screw steamer *Goth*. It will not be till next month, as I understand, that the new *German* eighth of the "G's.," will make her *debut*.

The vessels which are being purchased for the New York and South African service of the Union Line are all apparently to receive new names, so that the initial letter shall be an "S" in the same way that the intermediate fleet is entirely "G's."

The Cunard Line.

I am sorry, indeed, to see the Cunard Line have by a single year failed to let their *British Queen*—whose portrait I gave some few issues back—celebrate her Jubilee when in their service. She is now offered for sale as being an "ex-Cunarder," ready for immediate service. It may be worth noting that she sailed on her last Cunard voyage on the 7th September for Havre, whither she has made so many voyages. She returned to Liverpool on the 13th of the month. Captain Inman had the distinction of being her last commander.

During the last few years the Cunard Co. has done something to clear its lists of its more antiquated ships. In August, 1896, I analysed their fleet in this column, dividing it into four classes. Of these the first comprised the older vessels which had been lengthened, or had received new machinery. It then contained nine vessels of an average age of thirty-four and a half years, and of an aggregate tonnage of 18,136 tons. To-day but three of the nine remain. Though these three vessels are two years older than they were then, the average age is down to thirty and two third years. The tonnage of the three amounts to 6,894 tons. The group is therefore nearly cleared out. But that above it is quite ripe for an heroic operation of the same kind.

The West India Royal Mail Company's

report has been issued. They are expecting the delivery of a new steamer, the *Severn*, which has been built for them on the East Coast. This is for them a new departure. This addition to their resources will go to the Brazil and River Plate Line. Messrs. Napier & Co. are given the order for two of the new steamships which were spoken of as about to be given out when the last report was presented. Their names will be historic ones in the fleet. They will carry on the traditions of the *Tagus* and *Trent* recently sold out of the service. It is observable that the directors are acting wisely in keeping their fleet down to such vessels as are able to work with utmost economy. For times are so bad at present in the West Indies, that they must be prepared to work at the lowest margin of profit. The announcement is also made that as soon as the tenders are in form, the Company will make its offer to fulfil the Governments requirements as to the four contracts which are being asked for in connection with the recommendations of the recent Royal Commission, which sat to inquire into the condition and prospects of the West Indies.

The four services in question are two intercolonial at ten knots speed, and two oceanic lines. All are to run at fortnightly intervals. Of the local lines, one is to be maintained by steamers of 500 tons register between Trinidad, St. Kitts, and the intermediate islands, and the other by steamers of double the size between Trinidad, British Guiana, Barbadoes, and Canada. Of the more oceanic services one is to be maintained by vessels fitted for the conveyance of fruit between the West Indies and home ports. The vessels employed must have a speed of not less than 15 knots. The last of the four is to be also for the encouragement of the fruit growing industry. Its ports in the islands will be St. Vincent and Dominica, and its other terminus a North American port. But it is not determined as yet whether the objective shall be in Canada or in the United States. This will be terminable by the contractors if they can show that they have failed for a certain number of trips to secure a specified minimum of fruit shipments. The time for sending in tenders does not close till the 1st December.

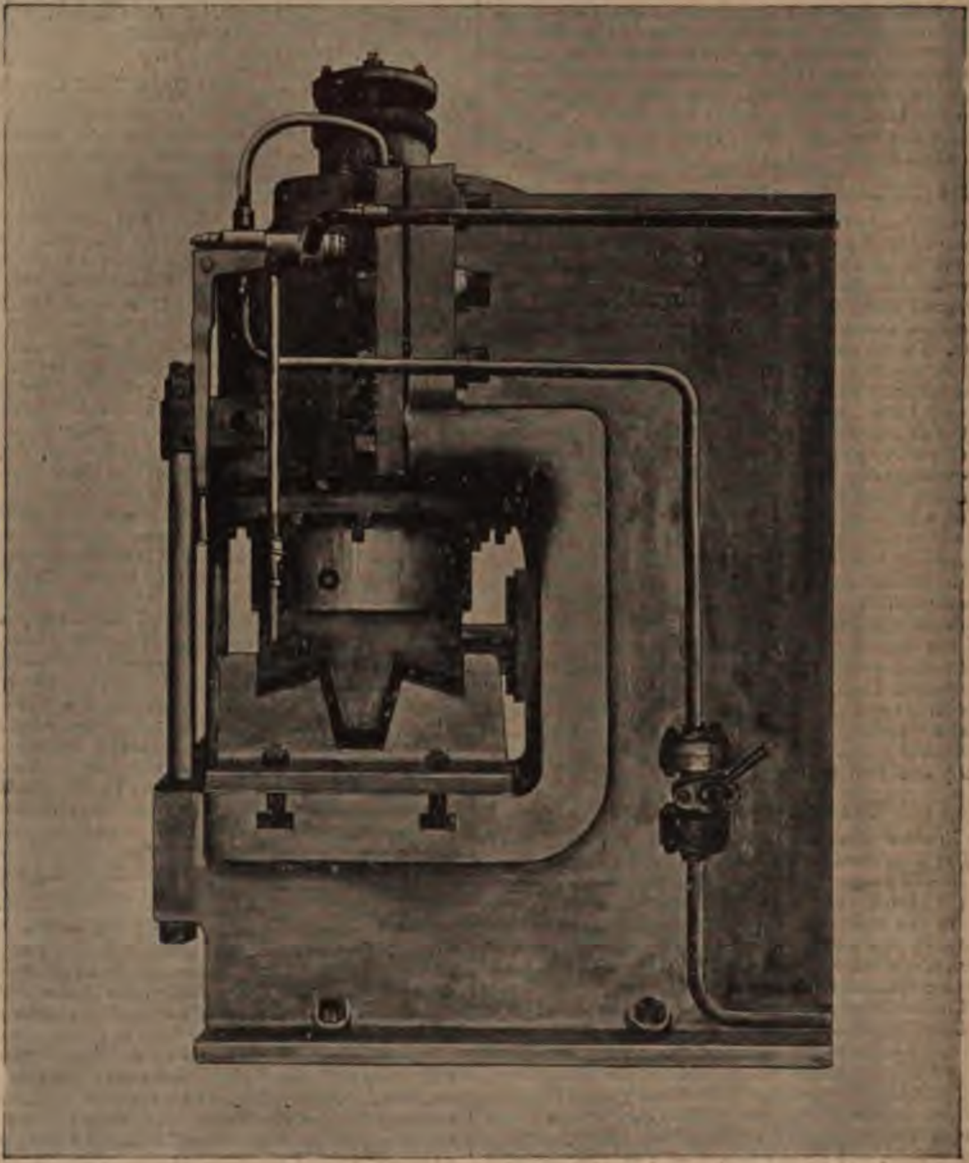
The Continental Mail Service.

The new French-built liner *Nord*, which has been built to carry the Dover and Calais mails under the French flag, has come on to her station, and has made a record between the ports of Dover and Calais, crossing in the remarkably short time of fifty-seven minutes. There seems to be considerable difficulty in conducting this service now. Dover Harbour has been rendered very difficult of access and egress owing to the sea which the half completed naval works there set up in bad weather. Calais, too, seems more difficult of approach than Boulogne, and on one occasion at least the Dover boat has had to use Boulogne. The advantages of Boulogne over Calais have been pointed out both in the Press and to the Postmaster-General by Mr. Merridew the indefatigable British Consul at the latter port. He seems to have been very finely snubbed for his pains by the officials of the department. But it does not at all follow that they will not act on his suggestions nevertheless, and he deserves the thanks of the public for his persistent efforts to do away with the disgraceful delays which so constantly take place in bad weather, and for his perseverance in spite of the discouragement he has received.

As a number of inquiries have been made about the October number of this journal, we beg to inform our readers that we have still a few copies containing the portraits of Dr. Inglis and Mr. Adamson and the record of the first decade of the Institute of Marine Engineers.

SHORT'S PATENT JOGGLING MACHINE.

ALTHOUGH the joggling of angles and other sections of bars for use in ships' frames is no new idea, it is nevertheless a fact that the system has not yet come into general use.



Short's Patent Joggling Machine. Fig. 1.

As early as the year 1844, the iron barque *Richard Cobden* had the frames joggled. It may be pointed out that the idea of joggling was carried out in the construction of wooden ships in which the frames were notched to receive the strakes in clincher-built vessels; however, when iron took the place of wood, it was found that the time and expense involved in joggling iron by the then known methods rendered the process impracticable on a large scale.

It will be readily seen that the great advantage of joggling consists in the reduction of unnecessary weight of material from which no structural strength is obtained, by the elimination of what is used as liners or packing pieces from the hull, which were used to fill up the spaces between the continuous curved frames and the lapped plates which are supported by them. It is stated that the estimated weight of packing used in a 5,000-ton ship is usually from 20 to 30 tons, so that this saving alone is in itself no trifling matter. Further, when the cost of fitting it is included, a result is arrived at which forms a very important item in the total cost of production. Again, another advantage accrues, for, by reducing the structural weight but without reducing the displacement, the carrying capacity is increased to the extent of this saving of weight, thereby increasing the efficiency of the ship as a carrying device. A considerable reduction in the cost of rivetting is effected, for, apart from the saving of weight by using shorter rivets, the cost of closing short rivets is much less than for long rivets in proportion to the length, the holes are filled better, and the work as a whole is much sounder, the parts being brought into closer contact.

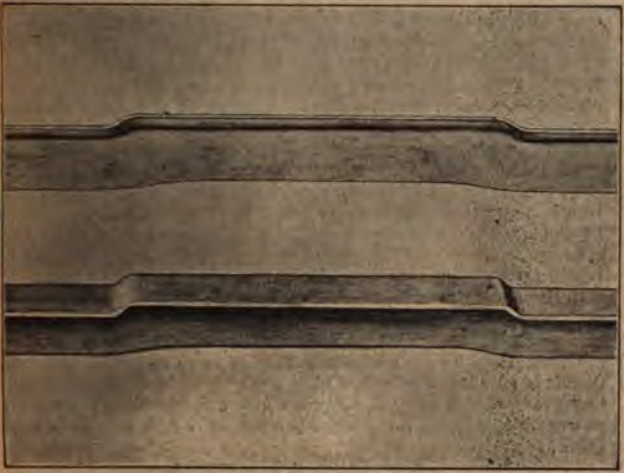


Fig. 2.

The joggling of the frames lends itself very readily to the adoption of clincher plating, *i.e.*, that one landing edge on each strake overlaps the top or bottom landing edge of the next strake, thus greatly simplifying the work of shell plating and rendering the detachment of plates for the carrying out of repairs or alterations particularly easy.

We illustrate in the adjoining diagrams, a machine invented by Messrs. Short Bros., of Pallion, Sunderland, which has been designed to joggle angle and other bars at one operation and without the necessity of independently holding the bar in position during the operation. Fig. 1 is a view of a hydraulic joggling machine fitted with double tools for joggling angle bars. In the tools shown it will be seen that the male and female portions fit into one another, leaving a space for the bar. In the other direction, that is, looking at the front of the tools, they are stepped with projections of the thickness equal to the amount of joggle to be made. When the bar is put between the tools in the direction normal to the plane of the paper and the tools are brought down the bar is joggled as shown in Fig. 2, the tools in finishing their stroke coming into contact with the bar on each side of the joggle and taking out any distortion which may have been initially set up during the operation. This, we understand, is a distinct feature which has not been hitherto obtained in the systems previously used.

Fig. 3 is a view showing double reverse frames joggled for the tank top plates, and Fig. 4 is a midship section of a hull, showing joggled frames and reverse frames.

We understand that for some time past Messrs. Short Bros. have been joggling the rame-work in connection with the double bottoms of the vessels they have been building, but in future they will adopt

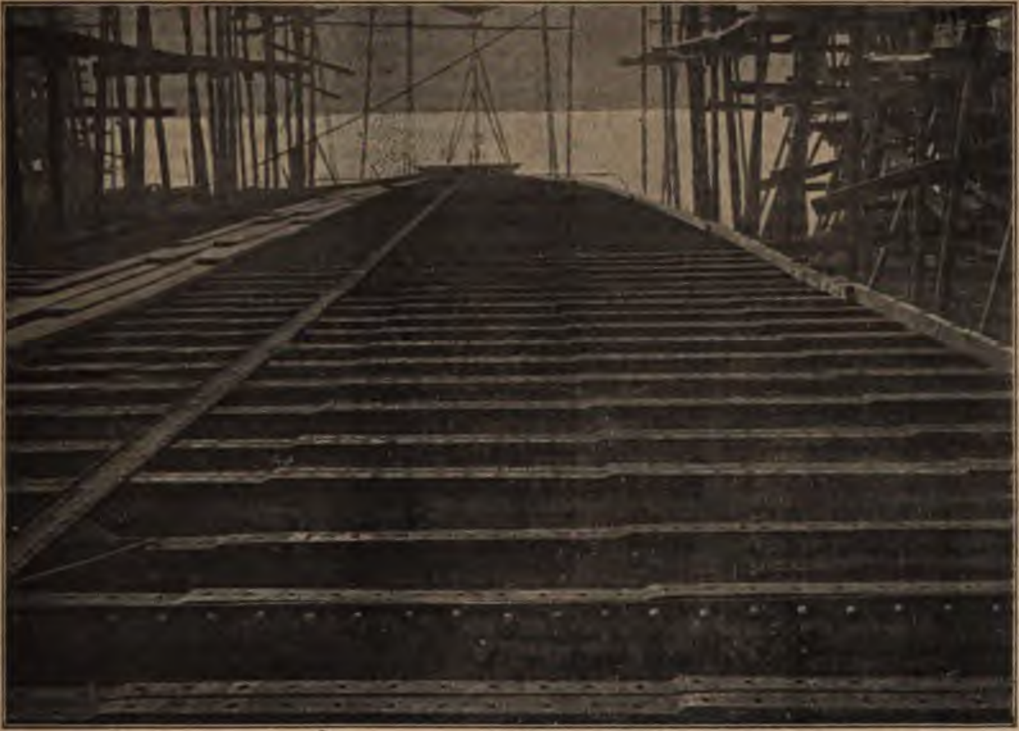


Fig. 3.

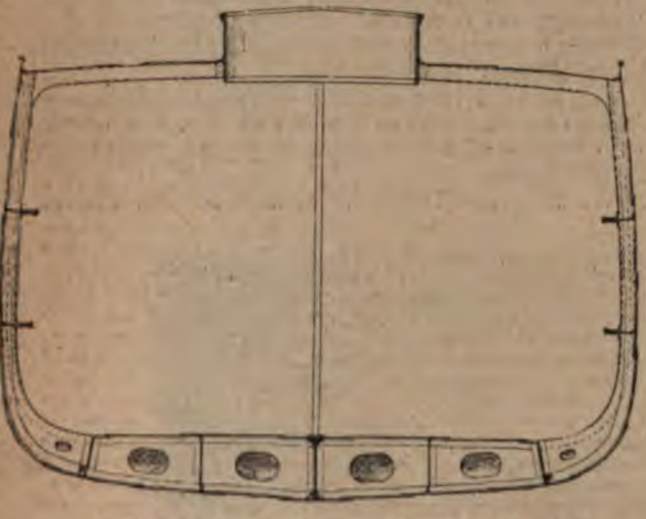
this practice throughout their vessels. At the same time they have decided to fit all the plating "clincher" style. By this means all the upper edges will be caulking edges, so securing the most efficient work.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The Claims of Engineers, R.N.

AN interested and spirited discussion on the question of the disabilities, rank, &c., of the engineers of the Royal Navy has been going on during the past month in the columns of the service papers, and a west-country contemporary opened its columns to the engineers and others who wished to take part in the discussion, the result being a batch of most interesting letters dealing with all the different aspects of this highly interesting question. One prominent service magazine claims that the engineers see but one side of the question, and that in their natural eagerness to secure social and professional advancement, they are prone to overlook the considerations that have delayed the fulfilment of their ambitions. Some of the correspondents who have entered into the discussion would certainly have done well to have looked at the question with more calmness, for intemperate effusions, it is true, do more injury than good. Concerning the delegation of authority, one correspondent puts forward a few instances to prove that the delegation of authority to engineers to award minor punishments to their men would be advantageous. He instances the case of a stoker brought before the "officer of the day" for a technical offence. The officer attempts to fathom the technicalities, and forwards the case on until it reaches the captain. The captain, not being a practical engineer, is bewildered by the explanation given by the offender, who succeeds in getting off with a warning, the captain being under the impression that the matter is quite as intricate as the latter has made it out to be. On the other hand, he points out that the case of a bluejacket, reported for some offence, if perfectly clear to his officers, and if sufficient evidence is forthcoming, the case is promptly and properly dealt with. As the writer points out, all engineers have had experiences of this kind, and if they had had the power, the case would have been dealt with summarily.



Short's Patent Joggling Machine. Fig. 4.

The Question of Executive Rank.

Whether engineers would rest content with obtaining authority to award minor punishments, and with securing executive rank, or whether they would at once commence an agitation to be granted executive command, remains to be seen, and it also remains to be proved whether the granting of the two first mentioned requests would weaken executive authority afloat. There appear to be some engineers, too, who would like to see the torpedo branch in the hands of the engineering department, but it is such demands as these that have delayed the granting of necessary reforms. The *Broad Arrow* believes that engineers, as a body, do not aspire to anything further than the control of their own department, and states that engineers profess themselves as having no confidence in the practicability of the experiment which is now being tested in the United States' Navy. If they are sincere in this profession, and are content to remain engineers, and leave the control of the ship and the weapons to the deck officers, the *Broad Arrow* believes that the efficiency of the Navy would be increased by conceding the claims, and one can only agree with the belief that the old and honoured principle of the strings of discipline of naval organization being grasped by a single hand is, in no sense, threatened by the claims of the engineer officers, and that it is possible that an improvement in the official status of the engineers would tend to popularize this branch of the public service, and draw into the Navy officers and gentlemen who could be fully trusted with increased responsibility. It is well known that stokers are more difficult to manage than marines, and yet a captain of marines has the power of punishing his men, while an engineer officer has not, and whether executive rank is ever granted to engineer officers or not, they should most certainly have the power of awarding punishment, a thing which is now denied them.

Some Further Grievances.

Another source of dissatisfaction to the engineering branch is the retention of fleet engineers beyond the age of fifty years. The grievance, says one correspondent, is of eight years' standing, and when the Admiralty first exercised their option it was accepted with very slight demur on the part of the officers, though the latter clearly saw that the addition of 70 ships to the Navy about that time necessitated an increase of engineer officers, and as the inducements offered to the members of the engineering profession outside Her Majesty's service failed to attract candidates, the necessary number could only be obtained by increasing the number of entries to Keyham College, and putting back the age of retirement until the numbers had been sufficiently augmented. It is the older engineer officers who joined the service some 15 years ago who have this grievance, for the retirement at 55 instead of at 50 is said to have been one of the prospects of engineer officers since 1890. Some improvement is also asked for in the position and pay of engineers, and one correspondent advocated that the engineers should have the same pay and retirement allowances as the executive officers. Then another correspondent points out that, rank for rank, executive officers are much younger than engineers, and he considers if justice is to be done that the engineers should have higher pay and larger pensions than executive officers, unless the Admiralty are going to alter the ages and higher grades of promotion in the engineering branch to correspond with the executive. At present the young executive finds no difficulty in obtaining his two stripes at about 21 years of age, but the smartest engineer can only succeed in obtaining the same rank after serving five years as assistant engineer and six years as an engineer. In short, it seems that the engineering branch are labouring under a good many disabilities, and it is hoped that this discussion will tend to mitigate them somewhat.

Portsmouth Dockyard.

The visit of the Lords of the Admiralty to this yard, it is hoped, will be productive of much good. Nearly the whole of the time was given up to hard work, interspersed with a little entertainment. Contrary to expectation, the name of the lady who will perform the christening ceremony for the *Formidable* was not mentioned during the visit. When this vessel leaves the building slip she will weigh 5,000 tons including the cradle. Not far short of 2,000 hands are now at work on her. The *Canopus*, on the contrary, has not more than 500 hands at work on her. The new torpedo-boat destroyer *Sylvia*, has, unfortunately, been obliged to report that her first machinery trials have proved unsuccessful. On this trial, which was to be for three hours at a mean speed of thirty knots, a boiler-tube burst just ten minutes before the three hours had expired, although it looked as if the trial would have been a most successful one. However, about a week later, another effort was made, and a successful trial took place. The mean speed of the three hours trial was

30·077 knots, with a H.P. of 6,500. She has since successfully carried out her steering, stopping, and starting trials. In connection with the new battleship *London*, which is shortly to be laid down here, it may be mentioned that the keel plates have been temporarily fitted. A good deal of material, too, has been accumulated in the yard ready for use when this event takes place. The *Terrible*, which is now in hand here having her engines examined and overhauled, will probably leave for the Pacific station when she is ready for sea. According to one report, an order was sent by the Admiralty directing that she was to leave for the Pacific two weeks ago, and this elicited the reply that her engines were not fit to undertake the voyage. Instructions have been received here to furnish estimates of the cost of refitting the *Active*. Every effort is being made to have the *Formidable* ready for launching before the end of this month. In a recent trial of the water-tube boilers of the *Seagull*, gunboat, everything worked as satisfactorily as could be wished for. It will be remembered that this is the only vessel in the Navy which is fitted with the Niclausse type of boiler.

Lord Brassey and the Late War.

A valuable addition to the great number of "lessons of the war," which have been pointed out by almost everybody having any connection with warships, is that of Lord Brassey. He was interviewed on the lessons of the war during his recent trip to America, and, according to the reporters, the crowning lesson, in his opinion, is the demonstration of the aptitude for maritime war, a characteristic of the English-speaking races; also "the immense superiority of good shooting over bad." It does not need much of a lesson to prove the superiority of good shooting over bad, and it is doubtful if these were the words used by Lord Brassey. He considers that the value of non-inflammable material in the construction of warships has been proved, and also the value of rapid-firing guns. "Good men are better than good ships, and when a navy has both it is ideal. I am not in favour of sacrificing armour on the ships that are to do the heavy fighting for either speed or coal capacity. It is better to have fewer guns with protection than more guns without protection. After a certain speed has been obtained it is a mistake to sacrifice protection. A speed of 15 knots is sufficient, I believe, for a battleship. Regarding the merchantmen, which are subject to the call for service as auxiliary cruisers, they are invaluable as scouts and look outs, but they should keep away from serious fighting. With them speed and coal endurance are everything." From accounts to hand we are given to understand that some of the advice so freely given is being acted upon, and that it has been resolved to do away with all guns in the secondary patterns of lower calibre than a 3-pounder, and for the second battery guns some automatic mechanism is hereafter to be used. Smokeless powder is also to replace the ordinary brown prismatic powder on all ships, and many other important changes are in contemplation.

Inflammable Wood for the Navy.

It is announced that a large order has been given out by the Admiralty for inflammable wood to be used on the various vessels now in course of construction on the building slips at Portsmouth, Devonport, &c. This order will bring gladness to the hearts of many naval writers, at any rate, for the fact that the Admiralty have persisted in using ordinary wood, in spite of the danger of fire during a battle, as was illustrated in the fight off Santiago between the American and Spanish fleets, has been one of the whips wherewith these "experts" have beat the Admiralty. It must not be supposed that non-inflammable wood will not burn at all, but, anyhow, it is an improvement upon the ordinary wood. Considerable use has been made of it in the American Navy, and the captain of the *Iowa* asserts that the wood stands the wear and tear of service as well as the ordinary untreated wood. It is to be hoped that not only will the wood be used in the ships now building, but that wherever possible, vessels already afloat will be stripped of the wood-work in them at present, and its place taken by non-inflammable wood. Before the battle of Santiago, every bit of wood was said to have been removed from the American ships, a precaution not taken by the Spanish.

Russia and her Disarmament Scheme.

Russia apparently does not believe in the maxim "practice what you preach," but would rather see others do as she tells them, and not as she does. Widespread activity continues in the Baltic and Black Sea yards. The result of the latest deliberations of the Russian Naval Department is to construct all future protected cruisers according to the type of the *Rossia*, but with, if possible, a greater coal capacity, and it has now been decided to commence the construction of five cruisers of this type. Energetic measures, too, are being taken, with the object of securing coaling stations from Cronstadt to the Far East. A scheme which has never taken shape is that of connecting the Black Sea with the Baltic by means of a trans-continental canal, and although such a scheme is possible, the tremendous cost would have to be taken into account. There is no doubt that Russia has gained considerable naval advantage by the acquisition of Port Arthur, and the defences of the place are being pushed forward as rapidly as possible, but considerable difficulty will have to be overcome before the Pacific Squadron is rendered independent, for between Cronstadt and the Far East, Russia has no coaling station. This deficiency, however, will be removed as soon as a chance offers itself for doing so. These efforts on the part of Russia to bring her Navy into a state of efficiency which will almost equal our own, throws increased responsibilities upon our own Navy, and therefore, no effort should be spared to keep pace with Russian naval expansion.

Devonport Dockyard.

The most important work at this yard at present is the preparation which is being made for the formal laying down of the keel of the new battleship *Bulwark*. It will be laid down temporarily in the unoccupied shed recently vacated by the *Psyche*, as this is more accessible to the building slip upon which it will be formally laid down. This will not take place until early next year, and it may be taken for granted that before this time the *Bulwark* will be well advanced. This would seem to be a curious state of affairs—a battleship being well advanced before she is laid down—but then the work which will be done upon her will, in a manner, be unofficial. A good deal of material is even now ready to hand, such as angles, deck plating, &c. Considerable interest attaches to the completion of the *Ocean*, which, most likely, in view of the work which, to some extent, has been slackened upon the *Canopus* at Portsmouth, will be ready for the pennant before the latter vessel, which was laid down a short time previous to the *Ocean*, and was launched several months before her. She has been under the new shearlegs ever since she vacated the building slip, and a considerable part of the time lost owing to delays during her construction has been made up. The decree issued by the Admiralty discountenancing some of the fierce rivalry in construction which has been going on between the three principal dockyards, has not, by any means, put an end to the race for first honours in the completion of the three ships of the *Canopus* class. In the course of the next six months some fourteen vessels which are undergoing construction in the private yards will go to this yard for completion, and a rough estimate of the cost involved brings the total up to £50,000 for the completion of these vessels. The *Hermes* will probably be the first to arrive. The other vessels are the *Highflyer*, building by the Fairfield Shipbuilding Co., Glasgow, and the *Hyacinth*, by the London & Glasgow Shipbuilding Co., Glasgow; the gunboats *Bramble* and *Britomart*, by Potter & Co., Liverpool, and the *Dwarf* and *Thistle*, by the London & Glasgow Shipbuilding Co.; the torpedo-boat destroyers *Avon*, *Bittern*, *Leopard*, and *Otter*, by Vickers, Sons & Co., Barrow-in-Furness, the *Express* and *Orwell*, by Laird Bros., Birkenhead, and the *Leven*, by the Fairfield Shipbuilding Co.

The Admiralty Visit to Portsmouth.

The recent visit of Mr. Goschen and his colleagues of the Board of Admiralty to Portsmouth, for the purpose of officially inspecting that establishment appears to have been a more thorough and practical one than those of former years, when their Lordships contented themselves with casually inspecting the work going on, and with taking a general walk round the basins. On the occasion of their visit this year their Lordships inspected the *Formidable*, preparing to be launched, and then made their way to the Naval Depot drill ground, where a review of about 3,000 seamen, marines, and stokers took place. They had a look at the *Canopus*, *Europa*, and *Andromeda*, but did not go on board, and in the afternoon inspected the Royal Marine Artillery at Eastney Barracks, afterwards visiting the training ship *St. Vincent*. On the following day Whale Island was inspected, and the torpedo depot at Vernon, and in the afternoon the R.L.M.I. Barracks at Forton, and Haslar Hospital. In the evening a ball was given in their honour. They also visited the waste grounds in the extension in connection with a scheme for providing the dockyard with more workshops. A few of the members inspected the *Terrible*, but what their opinion was, or is, of the big cruiser is not known. It is to be hoped that the visit will be productive of some good to our principal dockyard.

Celebration of Trafalgar Day.

The celebration of the anniversary of the battle of Trafalgar was carried out on the 21st ult. with a certain amount of enthusiasm, and especially by the Navy League and these who are in sympathy with its objects. The Nelson Column in Trafalgar Square was decorated by a continuous laurel wreath from capital to base. It will be remembered that last year this wreath was carried only half-way up the column. The base of the statue was carpeted with red cloth, and decorated with palms, evergreens, &c. The day was also observed in various other towns in Great Britain, and many of the mayors actively assisted in the celebration. We have not yet obtained recognition of Trafalgar Day as a national celebration, but the persistency with which the Navy League recall the day to the great British public, year after year, must, in the end, have this much to be wished for termination. The celebration of the great battle is now recognised by all to be merely a patriotic demonstration, with no thought of offending the feelings of our gallant French neighbours. Not only does it keep green the memory of Nelson, but it fosters a healthy interest in the Navy by the general public, and this cannot fail to have good results.

Naval Shipwrights.

The question of the pay and position of naval shipwrights has, for some time, been constantly brought before the attention of the members of Parliament representing the various naval ports, and these gentlemen have at last induced the First Lord of the Admiralty to grant them an interview in order to discuss this question with him. One of the chief points it was desired to refer to Mr. Goschen was that, after serving continuously for twelve years, a carpenter, although he may hold the rank of warrant-officer, only gets 1s. 6d. a day more than he was paid when he joined as a shipwright. On land in the north the average wage of this kind of mechanic is 7s. 6d. a day, and should such a mechanic join the Navy, he would only receive 4s. a day, and with very little prospect of getting much more, so that it cannot be wondered at that there is a scarcity of recruits for this rating, and that there is such a scarcity of skilled shipwrights is evidenced by the fact that a good deal of necessary work on the Fleet Reserve ships cannot be done by the present staff, and it is not at all unlikely that, before long, a good deal of this work will have to be put out to private firms. A naval carpenter is not, as the name would lead one to suppose, an artisan skilled only in wood-work; he is not only responsible for everything outside of the engine room in iron-work as well as wood-work, but he must be in a position to superintend repairs in almost every part of the ship, so that it is pretty certain that he requires a change of name, although Mr. Goschen has not thought it advisable to concede this point yet. To say that a man is a carpenter who has to undergo an examination which includes a sketch and description of the structural arrangements of a first-class battleship, with particulars as to its size, weight, thickness, armour plates, etc., is a misnomer. Again, when he is appointed to a ship, he has to prove to his superior officers' that he is familiar with all the details of the ship's construction. In short, it is to be hoped that the deputation to Mr. Goschen will thrash the matter out as far as possible, and obtain some, if not all, of the concessions for which the shipwrights ask.

Chatham Dockyard.

At this yard overtime is being freely resorted to, and especially in connection with the *Irresistible*, which, if possible, will be launched some time this month. The launching "ways" are being fitted under the vessel, and in order that she may be hurried forward to be ready for launching, a supplementary grant has been made, and in addition, money which was to have been expended upon the repair of certain other ships is all to be devoted to the *Irresistible*. As soon as this battleship has taken the water the slip she vacates will be made use of for the construction of the *Venerable*, and a large quantity of the material which is to be built into this vessel now lies here. The *Venerable*, although of the same type, will be some 10 ft. longer, and have a greater H.P. The *Goliath*, a couple of weeks ago, had close upon 1,000 men at work upon her, in order to get her ready for her steam trials as quickly as possible. On the other hand the *Pioneer* has had some of the hands which were at work upon her taken away in order that the *Dreadnaught*, which is undergoing an extensive refit, will be completed by March next. The torpedo-boat destroyers *Avon* and *Coquette*, too, are receiving a good deal of attention, and will soon be out of hand altogether. The *Warspite*, which has been undergoing an extensive refit, is at last completed. It will be remembered that she has had an entirely new armament of 6-in. quick-firing guns supplied to her. The *Cossack* is in dock here, and is also to be re-armed and refitted, and some internal improvements are to be made. The work will probably take six months and cost about £19,000. She is to be fitted with a new armament of modern 6-in. quick-firing guns. The *Pylades* is to have two 6-pounder quick-firers added to her armament. The work of lengthening No. 5 dock by about 50 ft. at the head, and widening its entrance, is now nearly finished. Previous to this alteration being made, the dock was too short to accomodate vessels of the *Powerful* and improved *Powerful* type. It will be the only dock here which will take vessels of over 400 ft. in length.

The Position of the First Sea Lord.

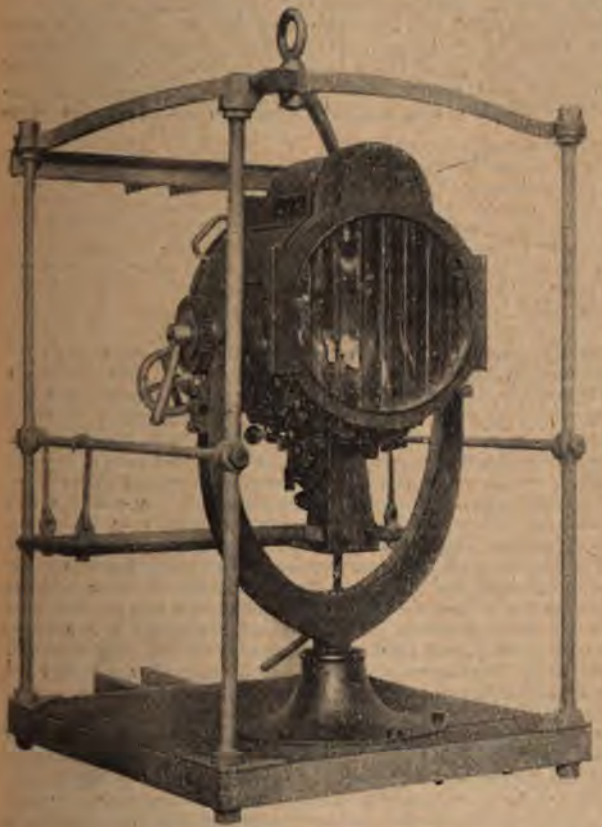
If the reports in the service papers are correct, Lord Walter Kerr is to relieve Admiral Sir Frederick W. Richards in the post of First Sea Lord, when that distinguished officer retires, which it is supposed he will do when he reaches the age of sixty-five, a time which is not very far off. During Admiral Richards' term of office it cannot be said that he has brought about any radical change, either for good or for bad. The Naval Intelligence Department has benefitted somewhat by his stay at the Admiralty, but everything else has practically remained as it was when he first accepted office. As each new man is appointed to the post of First Sea Lord, hopes are entertained that long looked for changes will be effected, but very little was done by Admiral Richards' predecessor, Sir R. Vesey Hamilton, or by Sir Anthony Hoskins, before him. The First Sea Lord, in fact, is almost entirely subordinated to the Civil First Lord, although his post is practically that of Commander-in-Chief of the Navy. A man of strong individuality, with a determination to carry out necessary reforms, could do much at Whitehall, but the permanent officials would not like to see such a man installed there. Lord Walter Kerr is said to be an out-and-out Conservative, and although his selection for the post would be popular, it is probable that he will leave things in the same condition as he finds them.

Sheerness Dockyard.

A good deal of overtime is being resorted to here in the constructor's and chief engineer's department in connection with the refit of the *Comus*, the completion of the *Pomone*, and of the *Condor* and *Rosario*. The *Perseus* having had her defects attended to, is now undergoing various trials. The *Pegasus* has completed her trials to the satisfaction of all concerned, and every credit is due to the Palmer Shipbuilding Co., who built and engined her. She has gone through her trials without a hitch. She exceeded the 21 knots of the *Prosperine* by one-fifth of a knot, and with a H.P. of 7,134 against that of 7,146 registered by the *Prosperine*. The preliminary forced-draught trials of the *Pactolus* and *Perseus* were, unfortunately, not quite as successful as could be wished for, and the first trial of the *Perseus* had to be abandoned owing to the bursting of a tube. As soon as the sloops, *Condor* and *Rosario*, are out of hand, two new vessels of this class are to be commenced on the slips they vacate. They are to be named the *Vestal* and *Sheerwater*. They will be practically duplicates of the *Condor* and *Rosario*. Their principal dimensions will be:—Length, 180 ft.; breadth, 32 ft. 10½ in.; draught, 11 ft. 6 in.; and displacement, 980 tons. They will be fitted with triple-expansion engines and water-tube boilers with 1,100 H.P. natural draught, and 1,400 with forced draught, with speeds of 12·6 knots and 13·25 knots respectively. Their armament will consist of six 4-in. and four 3-pounders, all quick-firing. One set of machinery is to be supplied by contract, and one made at Devonport.

A 40-Knot Torpedo-Boat Destroyer.

Some stir has been caused in engineering circles in America by the announcement that a Mr. Richard B. Painton has invented a marine engine which will enable a vessel to cut through the water at a speed of 40 knots. It seems that the Navy Department invited inventors of marine engines to send in plans and specifications for a new torpedo-boat destroyer, and Mr. Painton's invention is the outcome of this. The vessel is to have a carrying capacity of 435 tons, and the motors which will work the screw propellers are to be capable of operating at high speed and producing 2,500 revolutions a minute, which can be regulated instantly by the electric switchboard. The motors are reversible. She will have two conning towers, a battery of seven quick-firing guns, and two 24 ft. torpedo tubes. There will be accommodation for four officers and 60 men. Stores can be carried for 20 days. The dimensions of the boat are:—Length, 250 ft.; breadth, 24 ft.; depth, 10 ft.; H.P., 10,000; revolutions of screws per minute, 2,500; weight of machinery and ordnance, 8 tons; provisions, 3 tons; dynamos, 85 tons. The engines are but 6 ft. in height; they are of the type invented by Dr. Gustav de Laal. The engines will make the same number of revolutions as the dynamos which generate the electrical energy, which is transmitted by wires from a switchboard to the propeller shaft. These reach just inside the hold of the vessel, doing away with all long shafting, vibration, and straining of engines. The engines are only one quarter the weight of ordinary triple-expansion engines. The switchboard directs power to any separate propeller shaft. The pressure of a button is sufficient to start or stop, slow or quicken, any one of them. Mr. E. S. Cramp, of the firm of Cramp & Sons, thinks that Mr. Painton's invention will be most economical in both fuel and steam, and that the employment of a dynamo to run the propeller shafts is a decided gain.



Electric Light Plant. Fig. 1.

Pembroke Dockyard.

Towards the end of this month it is expected that the keel-plate of a new armoured cruiser will be laid down here. The midship-section drawings have been received. The *Spartiate* is now almost ready for launching, and little remains to be done except to select the lady who is to perform the christening ceremony. Work progresses steadily on the Royal yacht, but no definite date has as yet been set down for the launch, although it is practically certain to take place about the end of April next. The decorative work of the yacht will be carried out by the workmen at the yard here, but the upholstering will be done by private contract. As soon as she is launched preparations will be made for having her sheathed and coppered. Now that the *Andromeda* has left here, work on the *Spartiate* is being put forward more rapidly, as all the hands which were formerly employed on the first-named vessel have been turned over to her. It is expected that she will be in a very advanced stage at the time of her launch.

ELECTRIC LIGHT PLANT FOR SHIPS.

ELECTRICITY as a means of powerful illumination for special circumstances is becoming more used day by day. The use of an electric projector on eastward-bound steamers, in order to enable them to pass through the Suez Canal by night, has now become general.

We illustrate in the adjoining diagrams some of the appliances which are fitted by Messrs. W. H. Allen, Son & Co., of Bedford, for this purpose. Fig. 1 shows a special form of projector, Fig. 2 a mast-head light, and Fig. 3 the arrangements of the circuits. The projector is fitted with an accurately-shaped mirror, which in order to comply with the regulations of the Canal authorities is made capable of throwing a strong light 1,200 metres ahead. It is fitted with two lenses, one a dispersing lens of the ordinary type, and the other a special lens adapted to divide the beam of light into two portions with a dark zone of five degrees angular width beween them. Either of these lenses can be closed at will in accordance with the instruction of the pilot following the rules for navigation. At the side of the barrel of the projector is a prismatic spy-glass, presenting an image of the carbons, by which the operator can conveniently watch their burning. The lamp is arranged to be adjusted either by hand or by automatic mechanism. The cage containing the projector is suspended from the ship's bow as near to the water line as possible. Either one or two of the electric arc lamps, as shown in Fig. 2, are suspended above the upper deck; each lamp being powerful enough to light up a circular

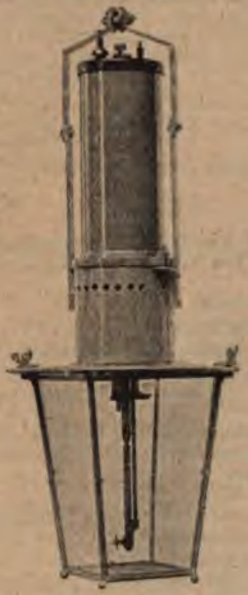
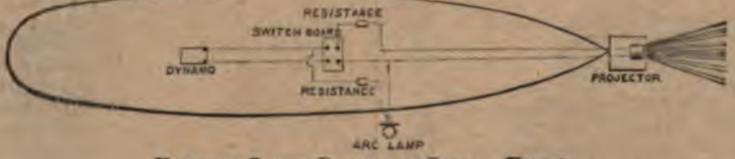


Fig. 2.

area of 200 metres diameter. The lights, both of the projector and mast-head lamps, are controlled from a two-way switch mounted in the chart-room, resistances of platinum wire fastened to slate in cast-iron frames being supplied for regulating the voltage. The arrangements of the circuits are shown in Fig. 3.

We understand that Messrs. W. H. Allen, Son & Co. have installed over 25 complete installations for this special purpose. Of course these search lights can be used for navigating dangerous coasts or for giving light when entering harbours at night.



Electric Light Plant for Ships. Fig. 3.

MARINE ENGINEERS' NOTES.

THE Council of the Institution of Marine Engineers have arranged to have original papers and discussions on the second and fourth Monday of each month. They have also arranged that the following lectures should be given for the junior sections of the membership, to be delivered by Mr. J. G. Hawthorn (Convener Educational Committee) on the first and third Mondays in each month. They commenced on 17th October. The programme of the lectures and approximate dates are as follows:

1898.	Monday.
1. Coal and combustion	Oct. 17th.
2. Heat transmission and formation of steam	,, 31st.
3. Distribution of heat and expansion of boilers	Nov. 7th.
4. Placing engines in position in ships ..	,, 21st.
5. Boiler construction, including survey of an old boiler	Dec. 5th.
1899.	
6. Slide valves and valve setting, including indicator diagrams	Jan. 16th.
7. Pumps and condensers	,, 30th.
8. Incrustation and corrosion	Feb. 6th.
9. The barometer, thermometer, and salinometer	,, 20th.
10. Casualties at sea and methods of repair	Mar. 13th.

Although these lectures are intended for the younger members all are invited to attend. It will be seen that the subjects are of a most practical nature, and that they embrace a full course in marine engineering. It is not mentioned that there will be an examination at the end of the session, but doubtless if any of the young members of the Institute should express a wish to be examined, and the results of the examination put on parchment, the convener of the committee, who has offered five guineas to be spent in prizes, would be only too pleased to arrange this matter for them; it would be a good exercise and a test of attention.

The seventy-seventh paper of the Transactions which is on water-tube boilers, by Messrs. G. Halliday, Wh. Sc., and E. Seabury, is now published, and has been distributed to the members. The paper itself has been already given to our readers, but the discussion in full, and the written contributions sent in to the honorary secretary are now published for the first time. Amongst the written contributions is a very important one from Sir John Durston, in which he answers a number of the points raised in the discussion. In answer to Mr. Laurie, who quoted from Mr. Howden the following, "that the same power as in the *Powerful* could be taken from cylindrical boilers on his system, having less weight, and the consumption of fuel would probably not be more than one-half of the Belleville boilers," Sir John says, "Here again no doubt Mr. Howden was speaking of boilers under a high forced draught on his system, and working a set of engines designed for one power only, and which could therefore be arranged to work at the greatest economy at that power; but even with these advantages it is doubtful if the proportionate economy named could be obtained." Sir John also quotes the consumption of coal on the *Niobe* as 1·55 lbs. per 2 H.P.

The paper read by Mr. Adamson before the Institute of Marine Engineers on Monday the 10th, at the Institute premises, Romford Road, should be of considerable interest to the members when they receive the paper. The value of the paper is enhanced by the position which Mr. Adamson holds in the engineering world as well as by his experience as hon. secretary to the Institute. His remarks on the deficiency in the instruction and training of engineers, and the lesson he urged on chief engineers should be marked. That chief engineers on board our steamers have enormous responsibilities there can be no question, but they have also responsibilities with regard to the training of the young engineers placed under their charge. The question of the ability of young engineers to make sketches and dimension them is only one of their duties, but it is one which the chief engineer is better fitted than anyone else to superintend. The time which a young engineer ought to spend in the shops practising as a mechanic before he is allowed to take charge of a watch is one of considerable importance. Mr. Hawthorn amused the members by telling them of a correspondent who wrote asking him if he could take him through a course of instruction in three months which would fit him to take a position as a fully-qualified surveyor of ships and machinery. In some places we know the time a student studies at a properly-equipped technical school is counted in his time. At some of the best technical colleges the course of study extends over two years. It is argued with some weight that the apprentice is better fitted to begin his practical training after undergoing this course of study, and that he knows better what he is doing when he has been so prepared. Many employers allow this time to count in his apprenticeship. Mr. Hawthorn advocated a five years' apprenticeship, but considered that part of the time might be served in the engine-room at sea. In this view he was not generally followed. Better and more efficient training appeared to be the keynote of the meeting. That young engineers on board steamers should practise sketching and dimensions was well put by Mr. Adamson, and it was supported and emphasised by the former chief of the Engineering and Drawing Department of the Technical College, Finsbury. They ought, he said, to sketch parts of the engines and machinery, and take dimensions directly from the parts themselves. In order to cultivate the faculty of observation it had been a custom after students returned from excursions to work to ask them to sketch parts of the machines they saw, describe their mechanism, and ask them to name the dimensions. Such a practise had met with considerable success. It was also necessary that some means should be adopted for letting it be known to everyone what had been done before. Last April a feed-heating arrangement was described at the meeting of the Naval Architects as if it was quite new; yet that very day he had seen the same kind of arrangement at Colchester, only rather better, and it had been in practice three years ago. The meeting was adjourned to Monday, October 24th.

The annual dinner of the Institute was a decided success, measured both by the number present and by the arrangements carried out. The President (Dr. Inglis) was supported by Sir Wm. H. White, K.C.B., F.R.S., the Hon. Jas. Burns, Sir James Mackay, K.C.I.E., Mr. Joseph Smith, R.N. Admiralty, Professor Barr, D.Sc., Glasgow; Capt. A. J. G. Chalmers (Nautical Adviser to the Board of Trade), Messrs. Thos. L. Devitt, Robt. Caird, J. Fortescue Flannery, M.P., P. Armour (Secretary to the British India Co.), Alderman G. W. Kidd, D. J. Dunlop, James

Hamilton, A. A. Denny, W. Strong, A. Keddell, Benjamin Martell (Chief Surveyor to the Board of Lloyd's), J. Macfarlane Gray, Geo. W. Manuel, R.N.R., George Holmes, Capt. W. C. Augore, R.N.R., Capt. Hutchinson, R N.R., W. G. Neal (of the MARINE ENGINEER). Asplan Bildam (first President) was in the vice-chair.

The speeches to the toasts and responses were not momentous. To marine engineers the important speeches were by Mr. A. Boyle and by Mr. Adamson. Mr. Boyle pointed out that the competition of other countries was beginning to be felt in marine engineering, and the only way they could contend with it was by the better training and technical instruction of their young engineers. The membership nowstood at 1,031, and as the lives of most of the members were spent within the sound of the throb of the engine, at such meetings as those of the Institute they became acquainted with one another, and assisted in their mutual improvement. Mr. Adamson said the object of the Institution was to advance the education and teaching of marine engineers. They ought all to work conscientiously to the best advantage of their employers, and assist the merchant princes of our country to maintain the place they had gained in the world. He wanted new members to come over and help them for the love of their calling and fellow-men. Their responsibilities were increasing every year. There ought to be a representative of marine engineering on the Board of Admiralty.

Dr. Inglis was on his feet for a short time, and made a short amiable address, which foreshadowed what the members had to expect when he will make his Presidential Address at the conversazione. The members of the Institution now number over 1,000, and as an institution it is safe. The premises in Romford Road are the property of the members clear of everything. They have a house, and there are members of sufficient number. In what direction will the new development go? The association which stands still goes back. The first decade has been spent in gathering members together and in furnishing them with a house to meet in, and one may wait to see whether the Institution as an institution will have a soul and a mission in England. The Institution is now entering on its second decade. What will be its record at the end of its second decade? There is the old legend of Undine and the knight. When the knight came Undine found her soul. Will Dr. Inglis be that knight? We will wait until the conversazione, and then we will know.

The *Jumna* sailed on Thursday with cargo and passengers for Queensland.

The transport *Delwara* arrived with the Guards on October 7th, and as they were home-coming London soldiers, they were greatly received at the Southampton Docks by the people there. The chief engineer is Peter Boyd, R.N.R. She sails from Southampton on the 27th October with troops for India.

The transport *Jilunga* (B. Stevenson, chief engineer) arrived at Southampton, October 24th, with invalids from Egypt.

The *St. Louis*, American liner, arrived in Southampton on 18th October from New York, and received quite an ovation from the representatives of the community. Evidently there is a strong bond of union formed between the shore on which Canute is reported to have put his foot in the spirit of rebuke, and that on which Columbus landed in the spirit of exploration and extension of premises. The friendship of Britain and the United States requires no fostering at Southampton; it is fully possessed, and there have been, during the last 12 months especially, many indications that the feelings of kinship between the nations have been stirred to desire a closer bond of friendship and union. This is as it should be, and will tend to the advantage of both, make them more as one people with free and enlightened policy of reciprocation.

The *West Ham Herald* has been giving extracts from our notes on leaders of the Institute of Marine Engineers, and has praised our two portraits of Dr. Inglis and Mr. Adamson. We have also to congratulate the *West Ham Herald* on its lively notes on marine engineering matters.

The manifestly providential lesson given this summer and autumn cannot be too persistently pressed home on the corporations of our cities and water companies, and the idea of a scheme for introducing salt water for sanitary purposes is one which commends itself to many engineers, to whom Dr. Routh's proposal of condensing water from the sea for domestic use appears too expensive.

Mr. J. Hawthorn gave the first of his course of lectures to the junior members of the Institute on Monday, the 17th October. He took up the question of combustion, gave an analysis of the principal coals, and showed how the quantity of heat in coal could be estimated. He distinguished between the heat liberated when carbonic oxide was formed from that when carbonic acid was the product of combustion, and he gave the quantity of heat liberated when one pound of hydrogen was consumed in oxygen. He pointed out that the hydrogen present had to be reduced by the equivalent of oxygen found in the coal. The question would appear to depend on whether the oxygen was free or not. If free, then it can hardly be distinguished from that of the atmosphere, and must be treated as part of that. But if the oxygen is in combination with hydrogen and forms water the matter will be different, and must be treated as indicated by the formula $C \times (H - \frac{o}{8})$. A test of coal to determine its calorific value will be made at seven o'clock on Monday, before Mr. Hawthorn's lecture begins.

The *Jumna* (chief engineer, Alex. McIndewar, R.N.R.) arrived at the end of September in the Albert Dock, London, with a cargo of frozen meat from Queensland in excellent condition. The refrigerator machine room is on the upper deck and occupies the position formerly occupied by the saloon when the ship was new. The alteration was made some years ago when the cargo refrigerator was fitted and ballast tanks placed in the ship. The appearance of the machine room on the ship's arrival in dock reflected credit on the chief engineer, while the interest and pride he manifested in the machinery when explaining the details of the American system of refrigeration were proofs of his attention and anxiety to get the best results. The *Jumna* sailed for Queensland on October 21st.

The *Matiara* (chief engineer, W. Highet, R.N.R.) arrived in the Albert Dock at the end of September, and sailed again for Calcutta on the 14th October.

The *Manora* (chief engineer, John Hall) sailed for Calcutta on October 28th.

DRAKE'S PATENT SCREW PROPELLER.

THE question of the efficiency of screw propellers has been a constant source of investigation both from a theoretical and practical standpoint from the early days of screw propulsion, and various are the modifications that have been made from time to time in the design in order to improve it as a propelling device when working in a liquid.

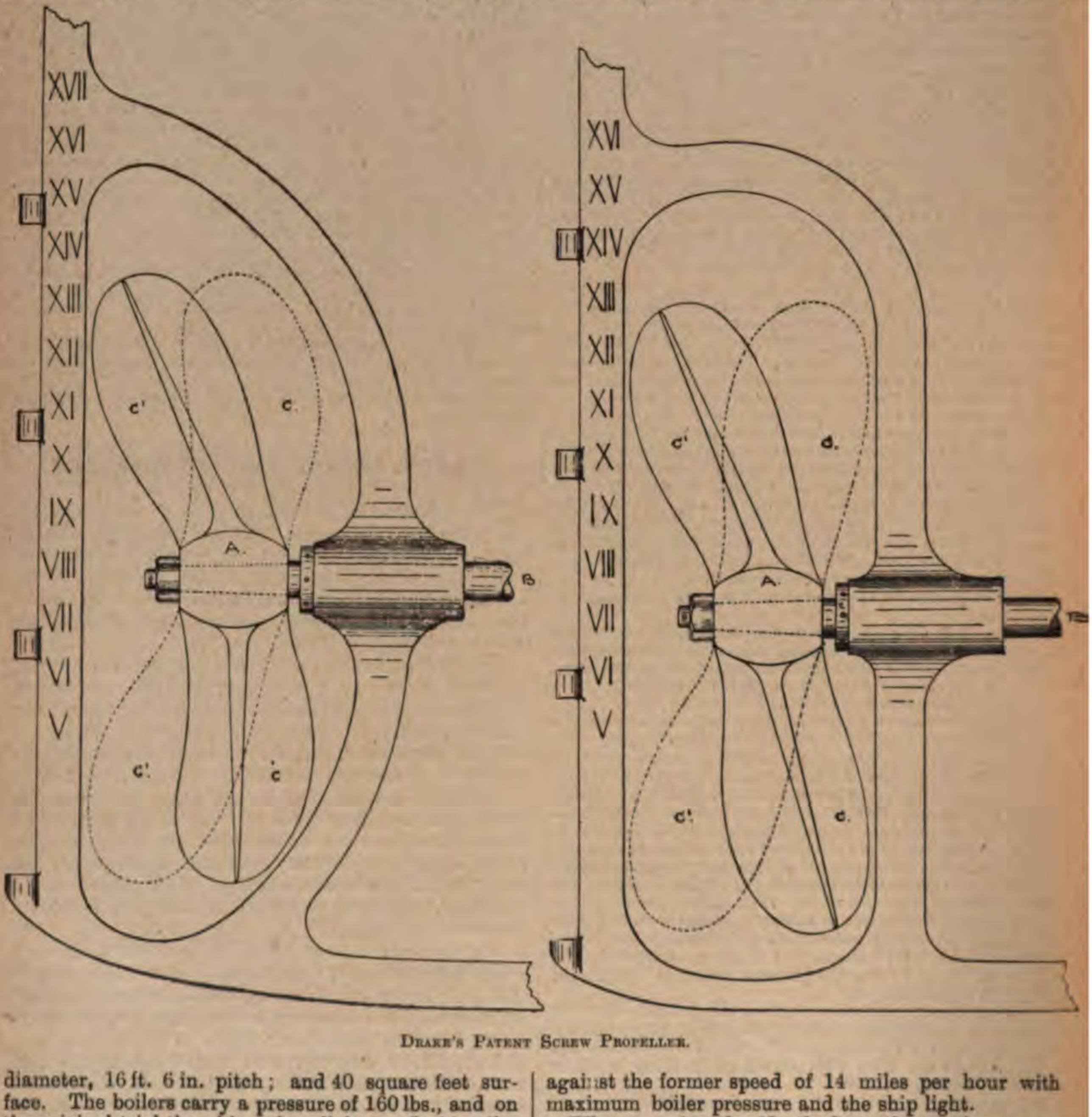
In the propeller shown in the adjoining illustrations, which is the invention of Messrs. L. H. Drake & Son, of 157A, Fenchurch Street, London, it will be seen that there are two sets of blades, one set raking backward and the other set raking forward. This arrangement allows of each blade working in solid water instead of in the back wash and broken water which is the case in the ordinary three or four-bladed propellers, in fact, the same conditions obtain in this new propeller as in the ordinary two-bladed propeller, but with the additional advantage of great steadiness of running, resulting from the use of a larger number of blades.

We understand that practical tests have shown a marked advantage of this propeller over ordinary propellers. In one case, the tug *Useful*, built and engined by Messrs. John Stewart & Son, Limited, of Blackwall, London, was fitted with one of the new propellers, 4 ft. in diameter, and the results of the trial runs, with and against the tide, gave an increase of speed of $\frac{3}{8}$ of a knot with less revolutions and without any increase of steam pressure.

It was further found that the vibration, which had been very excessive with all previous propellers, had entirely disappeared, and that the backing power was considerably increased. The first propeller put in has been working continuously since January last to quite recently, when it was broken by some sunken wreckage.

However, the results have been so satisfactory that the owners have replaced it by another of the same type.

It has also been tested upon the s.s. *Sea Belle*, which has a length of 200 ft. 5 in.; breadth of 29 ft. 2 in., and a depth of 12 ft. 9 in. The tonnage is 800 tons, and the engines are triple-expansion, having cylinders, 19½ in., 31 in., and 51 in. diameter, and 36 in. stroke. The old propeller was 11 ft. 6 in. diameter, 16 ft. 6 in. pitch; and 40 square feet surface. The boilers carry a pressure of 160 lbs., and on the original trial the ship, when light, made 14 miles per hour.



Drake's Patent Screw Propeller.

This ship was subsequently fitted with one of "Drake's" propellers of 10 ft. 8 in. diameter; 16 ft. 6 in. pitch; 40 square feet surface; and 5 cwt. less in weight than the original propeller. Trial runs were made on the River Thames and at Flushing with the ship loaded and having about 750 tons more displacement than in the original trial. Owing to the bad coal, great difficulty was experienced in maintaining the steam pressure, which varied between 110 lbs. and 140 lbs. When starting with 140 lbs., it quickly fell back to 120 lbs., and in one case to 110 lbs. Taking the runs throughout, a speed of 15 miles per hour was obtained with low boiler pressure and the ship loaded, against the former speed of 14 miles per hour with maximum boiler pressure and the ship light.

When crossing the North Sea, the engines were reversed from full speed ahead to full speed astern, and it was, we understand, impossible to tell the difference in the action, the propeller having such a powerful grip upon the water as to entirely prevent the usual racing of the engines in going astern.

ELECTRICAL NOTES.

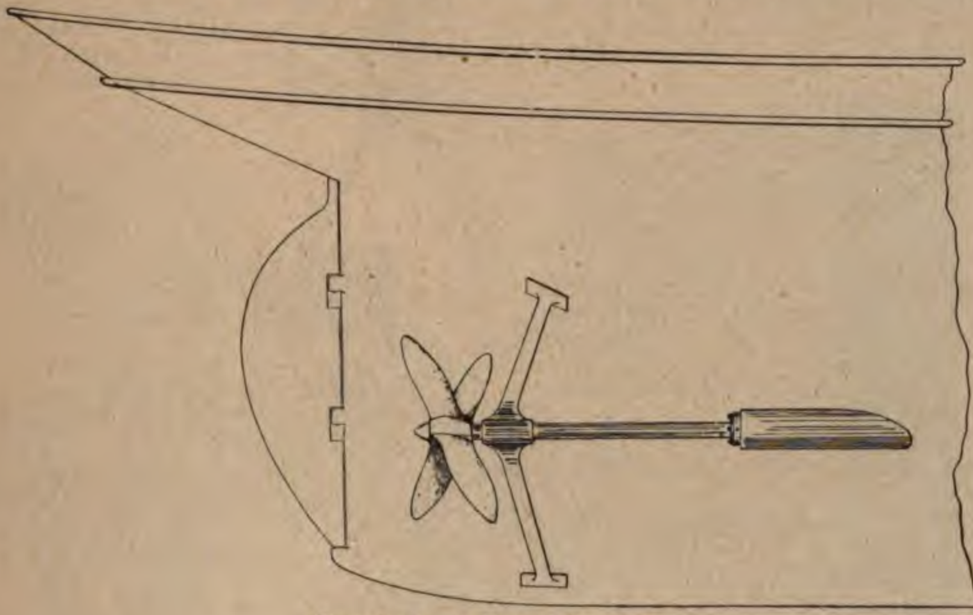
(From our own Correspondent.)

THE power plant on the battleship *Illinois* now being constructed at Newport, Mons. will be interesting to marine engineering circles not only because of its great size and capacity, but because it will embody many improvements found desirable as an experience of the Navy in the war with Spain. There will be an auxiliary plant for the electrical apparatus, compressed air engine, and other work. A dynamo plant for the incandescent lighting and ventilating fans has been designed and a separate equipment for four search lights is also to be constructed. Electric motors will be used for hoisting ammunition and similar work, and they will be connected to a power circuit. Electricity and compressed air will be the means of communication between distant parts of the ship; the engine-room will be connected with the conning tower and bridge by a telegraph system, a telephone and bell signals. Should two means of communication be cut off the third can be used. Electricity is, in consequence of the better knowledge of naval construction, entering more and more into the construction of the fittings of the Fleet.

The recent war and the threatening attitude of France should lead those in charge of the surgery department of the British Navy to consider the advantages of the Röntgen Ray appliances, and if desirable whether they should not form part of the outfit of every war vessel. Dr. Wm. M. Gray, of the hospital ship *Relief*, has been able to estimate properly the influence of the new scientific appliances as tested by experience in the relief of the wounded. He is the microscopist at the Medical Museum in Washington, and was detailed by that institution for surgical work with special reference to the diagnosis of gunshot wounds by the Röntgen Rays. In an interview the other day he said, "One thing this war has taught is that the probe in all its forms has gone out of use. No more searching blindly in a man's body for the bullet; no more danger of blood poisoning from the introduction into the wound of instruments of search. The fluoroscope tells us instantly where the projectile has imbedded itself, and we have only to cut it out as if it were there before our eyes; the ingenious electric probe and all similar devices have seen their day. In all future battles experts in sciagraphy will be attached of necessity to the medical corps, and the work of the surgeons will be materially assisted by their precise indications. We took out bullets by the pint on board the *Relief*, and almost without exception they were located by the X-rays."

The operating tables and the apparatus for producing the X-rays stand amidship in an open space ranged about with hospital cots. There was also a developing room for the plates such as were prepared for the surgeon's guidance. Very little time is taken to do the work. Dr. Gray said, "It is all done in a few moments, five seconds for a wound in the hand, 30 seconds for one in the foot, and not over 10 or 15 minutes for a wound through the thick pelvis. The patient is stretched out here, the X-ray bulb adjusted over the wound like this, the plate put under the limb or part where the wound is and the thing is done. The plates are developed almost instantly. In many cases we save hours of vain searching, not unfrequently we save a soldier's life." There was one case of a sciagraph that showed the fractured humerus and the imbedded bullet as if the arm were transparent. It was simply a few cuts and the bullet was out.

During the blockade of Admiral Cervera in Santiago harbour, the *Texas* and the *Brooklyn* kept their search lights playing on the mouth of the harbour all night, and it was quite impossible for him to get out under cover of the darkness. The search light is one of the great and useful electrical improvements of the Navy. The turrets of the *Brooklyn* as well as the *Texas* are operated by electricity instead of steam or hydraulic power. There were also on board range-finders, but the guns of the *Oregon* were sighted and fired in the old-fashioned way.



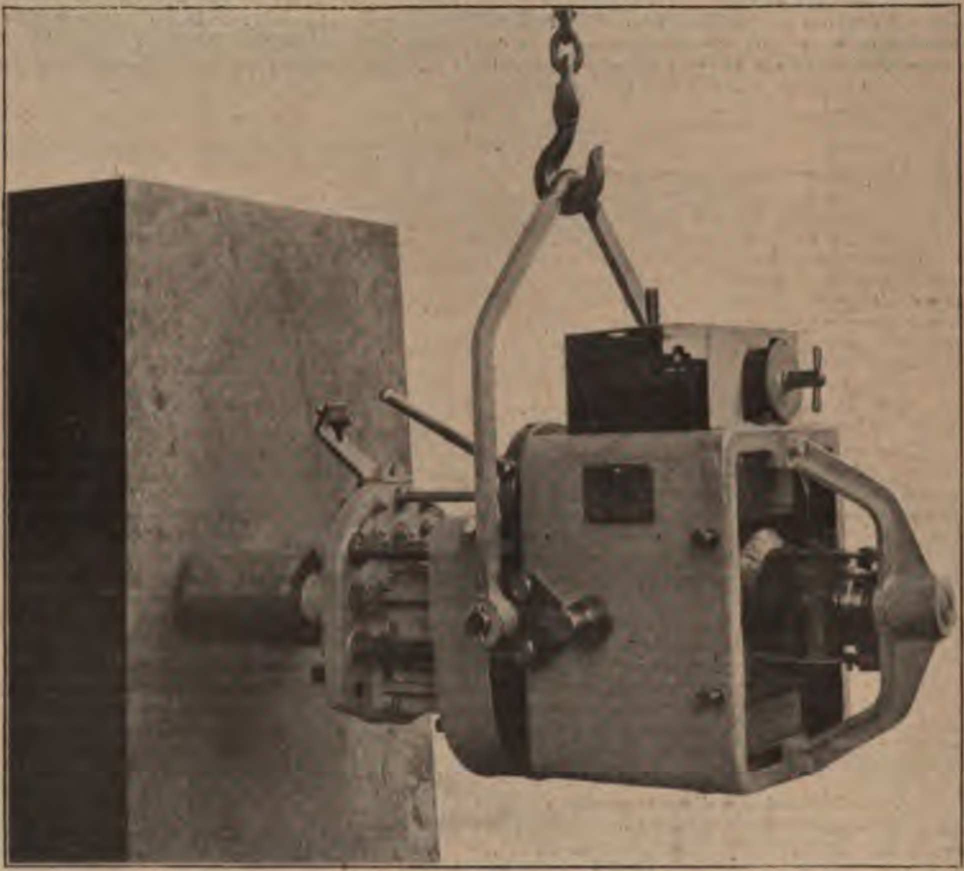
Drake's Patent Screw Propeller

The Navy Department of the United States Government will instal an electric light and power plant at the United States naval station at Paget Sound, Bremerton, Wash. It will cost 9,800 dollars.

A law suit has been brought by the captain of the port of Leghorn (Italy), against the owners of certain wooden yachts. These yachts were copper sheathed and moored with steel cables to a buoy in the harbour, to which some new warships and other steel vessels were also made fast. Electrical action ensued, the bottom of the vessels being the plates of a gigantic battery, and the fact of damage to the steel vessels from electrolysis was clearly proved. The court ordered that the port captain's order to have the copper-sheathed yachts removed to another part of the harbour be sustained.

The Barnados process of electric welding requires that the arc be established between the metal to be built up or repaired and a carbon rod held in the hand of the workman. To repair a blow-hole the surface of the work is first heated with the arc, then a number of bits of metal are placed upon it and dusted with sand or some other material to act as a flux. The arc is then struck between these pieces and the carbon, and when melted the current is switched off and they are forged into place before they harden. The proper current strength is determined by the experience of the workman. If the arc make no sound it is not strong enough. If it hisses sharply it is too strong. When the current is just right there is a kind of humming sound. When the patch is in place it should be heated with a charcoal fire, otherwise the unequal contraction of the parts may produce a rupture.

In the Slavranoff process the carbon electrode gives place to a metallic rod which may be of the same metal as the piece being operated upon. When a metal is selected which has a comparatively low temperature the melting of the electrode reduces the temperature of the arc, and there is less danger of burning the work. The electrode is suspended on a feeding mechanism over the work, and is fed mechanically. New teeth may be formed on a large wheel by the use of carbon moulds, and the method consists of melting down the material of the electrode and of pieces of metal placed in the mould. The current strength depends on the size of the surface worked in, and is at the rate of eight amperes per square millimetre, or 5,000 amperes per square inch at a minimum pressure of 50 volts. A cast-iron rod melts at the rate of 1 lb. in a minute and a half under a current of 400 amperes.



Electric Drilling Machine with Sling. Fig. 1.

Herr Spring has been making observations on the effect produced on muddy water when a current is sent through it or when a salt or an acid is added to it. The current may be very small, so long as the E.M.F. is high, the effect is the water becomes clear. He explains the action by saying that the particles of mud in a non-conducting fluid are in an electrical condition which prevents their aggregation and sedimentation. When the current flows the fluid is made a better conductor through the addition of an electrolyte, and the particles are discharged and are free to aggregate in masses and sink. It is possible that this may introduce a new type of filtering plants.

A magnetic speed indicator has been introduced, adapted to use where the instantaneous revolution speed of a shaft is to be read off. Permanent magnets are rotated by a shaft connected to the shaft whose revolutions are required. There is an aluminium disc resting on a pivot, resting on a jewel in the head of the shaft. The motion of this aluminium disc is restrained by a spring. Attached to the disc is a needle moving over a graduated scale. The motion of the magnets causes eddy currents to form in the disc, which make it turn in the direction of the magnets. The spring prevents it, and therefore the angle through which the disc turns is a measure of the speed of the shaft.

There has been a most neat and compact electrical set fitted by the Boston Towboat Co. for electric lighting. Engines and dynamos are fixed in one frame, and the dynamo is iron clad and impervious to moisture. Two of them are being made for the United States Government. The bearings are self-oiling.

A plan for utilising electricity for gun turrets is to place a large motor in one of the ducts leading to the turret, which would furnish the necessary power to work the turret itself as well as the two lifts to bring the projectile into position. The rams would be dispensed with; the projectile would be placed in a motor car in the magazine carried by it to the lift, raised to the level of the floor of the turret, and thence to the lift to the breech of the gun; the place of the steam pipes, donkey engines hydraulic cylinders and levers would be taken by two small electric cables, and the officer in charge would control everything with a switch.

The advantage of a motor which obviates the necessity of requiring a steam boiler and a fire to be stoked always appeals to one, and such a motor has been applied in large measure to land purposes in the oil engine. But in some cases it has also been successfully applied to marine purposes. M. H. A. Bertheau, Stockholm, writes to say that he has fitted them in as the motor for boats with entire success. He says that his engine can "turn first in one direction, then slowly, or quickly, to the other, stop, run, wait, and move full speed ahead or astern, as the bell rings from the bridge, in such a manner and in such strict obedience to the movements of the reversing wheel, that they appear almost sensitive." His motor is directly connected to the propeller shaft. He has delivered several boats fitted with oil engines up to 8 H.P., and they are running every day. He intends to construct motors up to 150 H.P.

ELECTRIC DRILLING MACHINES.

THERE is no doubt that electric drilling is fast superseding hand drilling in shipyards, dockyards, and engineering works, where electrical energy is readily available, as it is a more expeditious and economical system.

In Fig. 1 we illustrate one of the electrical drilling machines which have been constructed by Messrs. W. H. Allen, Son & Co., of Bedford, for this purpose. It is provided with a starting switch and resistance, holding-on magnets, and a sling which permits of the machine being used for drilling either horizontally, vertically, or at intermediate angles. It is suitable for heavy shell plate or similar work, and, we understand, is capable of piercing a steel plate 1 inch thick with a hole 1½ inches in diameter in less than two minutes. The range of the feed of the drill is 5 inches. They also manufacture two sizes workshop electric drill, fitted with either flexible stow shafts or solid shafts and universal couplings, one adapted for drilling holes up to ¾ inch diameter, and a larger one suitable for holes up to 1¾ inch diameter, the actual time occupied in perforating an inch thick steel plate with a hole 1½ inch diameter being only 1 minute 25 seconds.

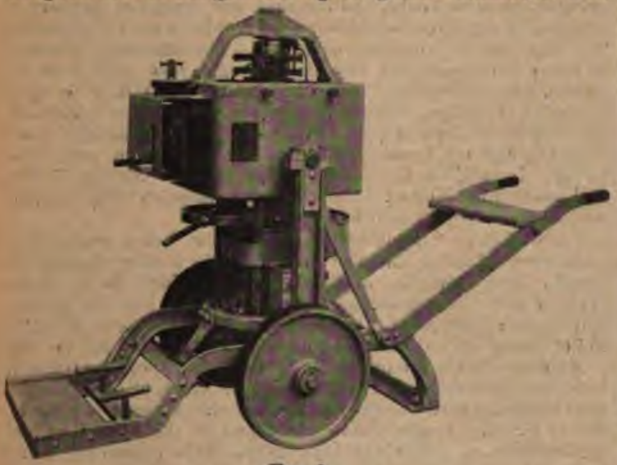


Fig. 2.

In Fig. 2 we illustrate an electrical drill mounted on a carriage with wheels for the vertical drilling of ships' deck plates, so that it may be wheeled in position, when it can be raised from its wheels by the screws with cross handles, so as to ensure its position being kept. The firm also manufacture a lighter tool of this description weighing about 5 cwt., which is suitable for drilling holes up to ⅞ inch diameter.

This type of tool should reduce the cost and necessary time required of such operations as they may be applicable to.

OBITUARY.

IT is with sincere regret that we have to record the death of Professor Alfred Dietrich, the Chief Constructor of the Imperial German Navy and Privy Councillor of the German Admiralty, which took place on Sept. 6th, at his residence in the Grundevald, after a short illness. He was the son of a physician, and was born at Pirna, on July 11th, 1843. He was educated at the Gymnasium, then the Polytechnic in Dresden, and at the Academy of Industry, Berlin. He entered the navy of the North-German Federation on September 1st, 1867, as assistant engineer. He worked in the Naval Ministry under Privy Councillors Ebertshagen and Koch, and was entrusted with the direction of the construction department, when Koch left the public service in 1890. The most important vessels in the Navy, and now in construction are according to his designs. He also designed the Imperial yacht *Hohenzollern*. The ships designed by him amount to an aggregate of over 200,000 tons displacement, and 300,000 H.P., and costing about 12½ millions sterling.

His services to shipbuilding extended, however, far beyond the Navy, and it was no doubt the influence brought to bear on shipbuilding by himself and his predecessors, that enabled the art to be carried on independent of foreign countries and enabled shipbuilders in Germany, to receive foreign orders for warships in the early eighties. His attention to his professorial duties had much influence on industrial development. He was a very capable, energetic, and genial gentleman, and no doubt the German Navy will always honourably remember his name.

In recognition of his distinguished services he received high honours from the German Emperor, and was the recipient of a gold medal from the Council of the Institution of Naval Architects of this country. Prof. Dietrich was one of the oldest subscribers to this journal.

TUG COMPANY, L. SMIT AND CO.

IT is a matter of educational interest to sometimes look around and see what our neighbours are doing in any particular branch of business, and it is now our intention to indicate shortly what Messrs. L. Smit & Co. of Alblasserdam, Holland, the large firm of Dutch tug owners, are doing.

This firm owns no less than 28 tugs ranging in H.P. from 30 to 1,500. Their largest vessels are the *Roode Zee* and *Zwarte Zee*, which have a length of 164 ft., and breadth of 30 ft., and a depth of 18 ft. They are provided with triple-expansion engines of 1,500 I.H.P. and have a bunker capacity of 600 tons. Next comes the *Oceaan*, which has a length of 149 ft., breadth of 29 ft. 5 in., and depth of 13 ft. 5 in., and is propelled by triple-expansion engines of 1,200 I.H.P.

Then come the *Noord Zee* and *Oost Zee*, having a length of 124 ft., breadth 23 ft., and depth 13 ft. 6 in., and triple-expansion engines of 800 I.H.P. And besides other smaller craft they have the *Zuider Zee* and *Lanwer Zee*, which have a length of 110 ft., breadth 20 ft. 8 in., and depth 13 ft. 6 in., and are propelled by triple-expansion engines of 500 I.H.P.

In our issue of August last, we described the floating pontoon dock for vessels up to 11,000 tons, constructed by the firm of C. S. Swan & Hunter, Limited, at Wallsend-on-Tyne, for the Stettiner Maschinenbau Actien-Gesse'schaft *Vulcan* of Stettin, and we then stated that this dock was towed from Wallsend to Stettin by Messrs. Smit & Co.'s tugs *Roode Zee*, *Zwarte Zee* and *Noord Zee*.

The *Oceaan* was the first foreign tug that had ever passed through the Suez Canal towing, which it did in towing the s.s. *Conrad*, a steamer of 3,087 tons, belonging to the "Stromvaart-Maatschappig Nederland," from Perim in the Red Sea to Amsterdam. Another important contract carried out by the firm was in connection with a floating pontoon dock for vessels of 1,350 tons, constructed by A. F. Smulders at Slikkerver in Holland, for the Portuguese Government, which the tugs *Oceaan* and *Oost Zee* towed from Rotterdam to St. Paul de Loando in Africa.

The firm have given the towing of dredging plant their special attention, and have earned a well-deserved reputation for this class of work, and it speaks well for their ability that out of 281 vessels of this kind, besides the two pontoon docks, which have been entrusted to their care for over-sea towing, they have only lost one dredger and four barges. This is good evidence of the ability of the tug-masters who are entrusted with the work.

It is an interesting fact also, that the pioneer ship of the modern ocean liner, the White Star steamer *Oceanic*, was towed in 1896 from Belfast to her last home in London, by the tug *Oceaan*, to be broken up. It will, no doubt, be remembered that the *Oceaan* was taken to Belfast to be overhauled, and to receive new engines and boilers, but a minute survey of her hull showed the futility of such a step.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from September 26th to October 25th, 1898 :—

Attwood, Harry M. (probationary), assistant engineer to the *Prince George*, to date October 4th.

Backler, Leonard, engineer to the *Pembroke*, for the *Buzzard*, to date September 29th.

Bills, W. W., assistant engineer, has been promoted to the rank of engineer in H.M. Fleet.

Brown, Percival R. T., engineer to the *Galatea*, to date Nov. 1st.

Chisman, Edward, engineer to the *Plover*, to date November 1st.

Collins, A. H., assistant engineer to the *Alacrity*, to date November 1st.

Cudlip, Edwin W., chief engineer to the *Vernon*, additional to date September 29th.

Dunn, Chas. F., engineer to the *Redpole*, to date November 1st.

Griffiths, Percy F., assistant engineer to the *Daphne* (temporary).

Hardwicke, Wm. W., engineer to the *Vivid*, for the *Sheldrake*, to date November 1st.

Hart, Alfred, chief engineer to the *Severn*, for the *Circe*, to date October 17th.

Havee, Ernest, engineer to the *Icarus*, additional, to date October 1st.

Hawkins, H., fleet engineer to the *Victory*, for the *Canopus*, to date October 22nd.

Head, E. A. W., engineer to the *Daphne*, undated.

Hibbard, J. A., engineer to the *Vivid*, for training school for engineering students, to date October 17th.

Hill, Walter S., assistant engineer to the *Leander*, to date September 28th.

Jameson, Thos. O., engineer to the *Victory*, additional, for the *Andromeda*, to date October 4th

Lamb, Francis E., engineer to the *Vivid*, additional, for reserve, to date October 5th.

Lowe, R., senior engineer, has been placed on the retired list of his rank at his own request.

Leahy, Wilton P., assistant engineer to the *Sans Pariel*, to date September 28th.

Lecky, Chas. B., engineer to the *Vivid*, for the *Leven*, to date September 30th.

Lilburn, Thos. E. F. (probationary), assistant engineer to the *Edgar*, to date November 1st.

Mallinson, E. D., engineer to the *Raven*, to date October 1st.

May, Fredk. F. (probationary), assistant engineer to the *Resolution*, to date October 4th.

Mitchell, Wm. H., fleet engineer to the *Edgar*, to date Nov. 1st.

Morris, Geo. H., engineer to the *Tamar*, additional, for Hong Kong Yard, to date August 9th.

Moysey, Alfred H., engineer to the *Pembroke*, for the *Swordfish*, to date October 16th.

Murphy, John, assistant engineer, to the *Pembroke*, for the *Dryad*, to date September 28th.

Northcott, A. F. R., artificer engineer to the *Severn*, for the *Circe*, to date October 4th.

Orchard, Geo. S., artificer engineer to the *Vivid*, for the *Sheldrake*, in reserve, to date October 15th.

Peacock, David, chief engineer to the *Alacrity*, to date November 1st.

Proctor, Thos. G., assistant engineer to the *Repulse*, to date October 4th.

Rolles, Absolom R., engineer to the *Wildfire*, for the *Ariel*, to date October 15th.

Roskruge, Francis J., assistant engineer to the *Terrible* (temporary), to date October 4th.

Sanders, John S., assistant engineer to the *Pembroke*, for the *Gleaner*, undated.

Screech, Jonathan J., assistant engnieer to the *Pembroke*, for the *Comus* (temporary), to date October 4th.

Shillcock, Arthur E. (probationary), assistant engineer to the *Royal Oak*, to date October 12th.

Smith, J. A., fleet engineer, has been promoted to the rank of Inspector of machinery in her Majesty's fleet.

Swinney, E., engineer, has been promoted to the rank of chief engineer in her Majesty's fleet.

Teed, Henry R., engineer to the *Wildfire*, for the *Mallard* to date September 29th.

Townsend, Walter engineer to the *Pigmy*, to date November 1st.

Vibert, John E., engineer to the *Royal Oak*, for the *Dragon*, to date October 12th.

Wallace, Chas. J. M., assistant engineer to the *Benbow*, to date November 1st.

Whittingham, Wm., chief engineer to the *Pembroke*, for the *Pegasus*, to date September 30th.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

NOTWITHSTANDING that Clyde builders are very actively consigning new vessels to their "native element"—the output during September having attained to a figure hitherto unprecedented for any corresponding period, and that for the month just expired being not far behind—the berths are no sooner vacated than new keels are found awaiting the process of laying down. Anything like reasonably smart delivery is so out of the question that orders for new vessels are being witheld. This is so in the case of several new vessels for Clyde passenger service, the Caledonian Steam Packet Co., for example, having now decided to abandon, at this time, their intention of augmenting their fleet by two swift and palatial vessels.

Uncertain delivery, brought about by the full and overflowing state of the order books, and the slow and irregular delivery of material is not of course entirely answerable for the lull which has now taken place in booking contracts. The successive advances in prices of material and the higher wages now paid have, of course, stiffened builders' prices and helped materially to bring about the cessation. During September, the tonnage booked on the Clyde did not exceed 6,000 tons—an exceptionally small amount—and the bookings for October have been very little better. In fact, but for the 8,000 ton steamer for the P. & O. Co., secured by Messrs. Caird—afterwards more fully referred to—the total would have been even less.

Prices of steel ship plates and angles, also boiler plates have undergone a further advance in the Clyde district during the month. The Steel Co. of Scotland have added 2s. 6d. to the price of steel ship plates, making the figure £6 12s. 6d. per ton and a similar addition to the price of angles, making it £6 7s. 6d. Boiler plates are advanced 5s., making the price £7 5s. per ton.

Messrs. William Simons & Co. of Renfrew, about mid-month, launched from their yard a steam-hopper barge, all complete and with steam up ready to start as soon as she entered the water. She is for the Thames Conservancy and is the second of two similar craft on order for that body. This eminently useful vessel is 190 ft. long by 30 ft. broad, and has a depth of 15 ft. 3 in. She has triple-expansion engines, working up to 1,200 H.P., and has capacity for 1,000 tons of dredgings. The experience of Messrs. Simons & Co. in building this type of vessel enables them to adopt innumerable ingenious contrivances for saving time and labour and facilitating the work of dredging.

The speed trials of one or two important steamers took place during the latter half of the month, including the Fairfield built first-class cruiser *Argonaut* and the large screw steamer *Bengalia*, built by Messrs. Stephen & Son, of Linthouse, for the Hamburg-American Co. The latter is 500 ft. long, has a cubic measurement capacity for cargo of nearly 20,000 tons, and is perhaps one of the best equipped cargo and cattle carrying steamers afloat. She will carry 900 head of cattle in all, and electric lighting is provided throughout the entire ship. She has a double cellular bottom all fore-and-aft, and the portion under the machinery space is subdivided and arranged for carrying fresh water for cattle, with all necessary pipes and connections for distribution throughout the cattle spaces. She has as many as 14 powerful steam winches and 30 derricks for the rapid and convenient handling of cargo. Her engines, on the triple-expansion principle, are supplied with steam at 180 lbs. pressure from four boilers fitted with Howden's forced draught.

Messrs. Ritchie, Graham & Milne, shipbuilders, Whiteinch, have recently booked orders for a variety of vessels of the light draught description of which the firm make a speciality. These comprise three cargo barges for the East Indian Railway; for which concern the firm has already built largely; a stern-wheel steamer for the African Lakes Company, and an oil-carrying steamer for foreign owners.

Messrs. Caird & Co., Greenock, contracted early in the month

From a Photo taken by W. Hoffërt, Berlin.]

THE LATE PROFESSOR ALFRED DIETRICH,
The Chief Constructor of the Imperial German Navy and Privy Councillor of the German Admiralty.

with the Peninsular and Oriental Co. for the construction of a steel screw steamer of about 8,000 tons and 11,000 H.P.; in all essentials similar to the *Arabia*, completed for the same company during the early part of this year. The new vessel's length will be 500 ft.; breadth, 54 ft.; depth moulded, 37½ ft. The engines will be of the triple-expansion type, having four cylinders with four cranks, and be capable of propelling the vessel at a high rate of speed.

Messrs. Taylor & Mitchell, the new shipbuilding firm at Greenock, who have already two steamers on hand, have concluded a contract with a firm of London owners for the construction of a steamer of about 1,000 tons gross register.

Messrs. Carmichael, McLean & Co., Greenock, whose berths have been fully and constantly occupied for a considerable time past, have just contracted to build two steel screw steamers, each of about 1,600 tons gross register, to the order of Danish owners.

Messrs. White & Son, engineers, Greenock, have contracted to build a pair of compound engines for a vessel belonging to Messrs. Ross and Marshall. The engines will be of 40 H.P. Messrs. White have also contracted to build engines of 60 H.P. for a steamer at present being built for the Mosswell Bay Co., Cape of Good Hope, by Mr. McIntire, Rothsay.

Messrs. Chambers Bros., yacht and boat builders, have received an order for twelve of their patent collapsible lifeboats from Messrs. Richardson (Wigham) & Co., Newcastle-on-Tyne, and Messrs. Lobnitz and Co., Renfrew. Those ordered by the latter shipbuilding firm are for a steamer under construction for the Japanese Government. The boats will be each 28 ft. in length, built of teak wood (diagonal) and varnished.

While there are several engineering works in Greenock solely engaged in manufacturing machinery for vessels built by shipbuilding firms who are not themselves engineers, it appears that this means a very great lack of engineering facilities for meeting the demand which exists. Port Glasgow, as is well known, is one of the busiest shipbuilding localities on the Clyde. Besides the well-known firm of Messrs. Russell & Co., who have for years been at or near the top of the list of firms throughout the kingdom in the matter of yearly output, there are four other shipbuilding firms in Port Glasgow and two in Greenock, who have no engineering and boiler works connected with their works, the consequence being that they have to send the steam vessels built by them to Glasgow, or elsewhere, for the purpose of getting their machinery fitted on board.

Several of the firms in question have in the past been principally employed in the building of sailing vessels. This, however, seems to be a thoroughly decadent branch of shipbuilding so far as Port Glasgow and Greenock are concerned, and at the moment there is not a single sailing vessel being built, a state of matters which is for the most part likely to continue. The demand is all for steam tonnage, and at the present time the amount of work on hand in the seven yards under consideration is represented by some 70 vessels, aggregating 160,000 tons gross. Last year the output of these yards amounted to some 35 vessels, of about 70,000 tons. Having to send vessels to Glasgow to be engined by firms there incurs heavy expenses for towage and pilotage, and for extra time of workmen, harbour dues, haulage of machinery from works to crane, and crane dues, all of which would be minimised or obviated if proper engineering facilities existed near at hand.

Engineering works on an adequate scale are thus evidently a "felt want" at Port Glasgow, and this want is proposed to be supplied by a company, with a share capital of £100,000, to be named the Clyde Engineering Co., Limited. The directors of the concern—amongst whom are Messrs. Wm. Hamilton, of Wm. Hamilton & Co., shipbuilders, Port Glasgow; William D. Gillies, director of Wilsons & Clyde, Limited; and William D. Cairney, director of the Scottish Alliance Insurance Co., Glasgow—have secured a suitable site in Port Glasgow, with an extensive river frontage, and intend to erect upon it engineering and boiler works on the most modern principles, fully equipped with all the best appliances for turning out work in a most expeditious manner; also, to provide tools of the newest and most modern description, so as to produce first-class work at the lowest possible cost. It is also intended to erect a wharf along the whole river frontage with suitable wharfing gear, and all requirements for ships being moored thereto, and to erect a powerful set of shear-legs capable of undertaking the heaviest work. A railway siding will also be led into the works, which will add materially to the other advantages, and with the works alongside the wharf a great saving of labour will be made in the fitting of machinery and boilers on board.

Greenock industries as well as its shipping are likely to benefit from the step which the Anglo-American Oil Co. is reported to have in view. This is the establishment of large reservoirs for the reception of petroleum from tank steamers as they arrive, and for its storage until distribution to the various centres as required. Oil supplies for Glasgow and the West of Scotland have hitherto been brought *via* canal to Port Dundas, Glasgow, in small steamers from Belfast, where large iron tanks were erected for storage purposes some time ago. By establishing reservoirs on the Clyde, supplies can be brought direct from the American ports, thus dispensing with the cross-channel freight and the extra handling at Belfast.

Apropos of the above particulars it is also reported that a well-known firm of Glasgow merchants are negotiating arrangements for establishing petroleum oil tanks in the Glasgow harbour, the oil to be brought from Batoum. Up to the present there has been no oversea traffic in oil to speak of, and the bye-laws of the Clyde Trust as to disembarking and storage are in need of revision on the subject.

The first annual report of Messrs. Flemming and Ferguson, Limited, engineers and shipbuilders, Paisley, which was issued early in the month must have afforded satisfactory reading for the shareholders of the new company. It stated that the directors of the old company of Flemming and Ferguson, Limited paid out of the profits of the company, for the first half of the financial year, an interim dividend at the rate of 10 per cent. per annum on the Ordinary, and 5 per cent. per annum on the Preference shares of the old company. The balance at credit of profit and loss account after deduction of interim dividend paid in February last, shewed a sum of £21,577 14s. 10d. From this sum the interest due 1st October on the Preference shares of the company, amounting to £272 0s. 3d. was paid, leaving a balance of £21,305 14s. 7d. to be disposed of. The directors proposed that this should be dealt with as follows:—dividend to Ordinary shareholders at the rate of 12 per cent. per annum on £90,000, £7,800; depreciation fund, £2,000: reserve fund, £5,000; balance to be carried forward, £6,505 14s. 7d. No credit has been taken for profit on work in progress, such being entered at actual cost. Throughout the year the works have been well employed, and a satisfactory output maintained. The work in hand and on order gives every promise of satisfactory results for the current financial year.

Under the style of Wilson's and Union Tube Co., Limited, a company has been formed for the purpose of acquiring and amalgamating the business carried on by Messrs. John Wilson & Son, Limited, at the Govan Tube Works, Govan, and the business of the Union Tube Co. of Coatbridge. The businesses are to be taken over as going concerns as from 1st July, 1898. The tube manufacturing business carried on at the Govan Tube Works is one of the oldest and best known manufacturing concerns in the country. The works are of modern construction, and have been largely increased during the last year or two. The works of the Union Tube Co. are most favourably situated near Coatbridge, and are the most modern in the trade, having been built only a few years ago. This business has progressed so rapidly that the works are at present being increased to double their original capacity, and there is sufficient vacant ground to provide for much larger extensions. The increase of productive power has in both cases been a matter of necessity to cope with the expansion of the business, and it is obvious that further expansion on sound and remunerative lines will be facilitated by the amalgamation. The plant of the two works which is in thoroughly good order, consists of four Siemens Regenerative Gas, and three Cold Lapwelding Furnaces, fully equipped with all the necessary machinery for the manufacture of all classes of iron and steel tubes and fittings.

The Grangemouth Dockyard Co. about mid-month received an order from Messrs. Jacobs and Barringer, of London, on behalf of foreign owners, for two bulk oil carrying steamers of 2,000 tons capacity, of the most modern design, and embodying all the latest and approved appliances for this class of vessel. The engines and boilers will be supplied by a Glasgow firm. About the same time the dockyard company launched from their yard the first of two ice-breaking steamers, built to the order of the Finska Steamship Co., of Helsingfors, Finland. These vessels present several points of interest incident to their intended service in ice-bound waters. The stems have been specially designed and strengthened for breaking up great thicknesses of ice; and the stern, of the gunboat pattern, overhanging and protecting the rudder, is provided with cast steel cutting edge where it enters the waters, and the rudder is a solid steel casting of great strength, and weighing several tons. These castings are so designed as to enable the vessel to break up thick fields of ice as readily going astern as going ahead. The propeller, being subject to severe concussions with floating blocks of ice, is of nickel steel, and in the machinery department are introduced a number of special arrangements, such as devices for the prevention of freezing, and the strengthening of the requisite parts to resist the shocks met with by the propeller. The Dockyard Co. have at present as many as eight vessels on hand, and they have recently contracted with a Falkirk firm for the lighting of their yards and workshops with electricity. The plant will be capable of supplying current for 300 lights, 14 of which will be on the arc principle for outside lighting.

In connection with the new dock works at Grangemouth, described in last month's notes, Messrs. Charles Brand & Son, the contractors, have now commenced preliminary operations, and are laying down a line of rails with a view to the laying down of their plant. The water area of the new dock to be constructed will be about 33 acres. This will be connected direct with the Forth by a new channel, which about the middle of its length will be expanded to form a large canting-basin. There will also be a new channel connecting the new with the old dock further inland. The new works are expected to be completed in about four years' time.

Messrs. John Duthie & Co., who some little time ago entered upon a lease of the shipyard at Montrose, on the Forfarshire coast—for a number of years occupied by the now defunct Montrose Shipbuilding and Engineering Co., Limited—launched on the 1st ult. their first vessel, a steamer of about 500. The vessel had been left in frame by the previous occupants of the yard, and has been completed by Messrs. Duthie & Co, on the original order for Mr. Joseph Constant, of London.

During the last week of September exhibitions of the working of pneumatic machine-tools of the Boyer type, now very extensively introduced by Messrs. Taite, Howard & Co., of Queen Victoria Street, London, were given in the boiler works of Messrs Muir & Houston, Limited, Kinning Park, Glasgow. These included drilling, caulking, chipping and rivetting tools. A small Boyer drill was in use boring round furnace mouths and front plates, and with an air pressure of 60 lbs. per sq. in., bored 52 holes 15-16 in. diameter through ⅝ in. steel plates in 1½ hours. A large drill was used for boring stay holes 1⅝ in. diameter through 1-in. shell plate, which it accomplished under three minutes per hole; it also tapped 1⅝ in. holes through end plate and combustion chamber plates in 1 minute for each hole. A Boyer hammer was used for heavy plate caulking, and chipping, and caulking round 1⅛ in. stays, at the rate of one minute per stay. This was done in the presence of representatives from most of the principal engineering, boilermaking, shipbuilding and locomotive works, who expressed themselves highly satisfied with the results obtained. A small breast drill was used for boring ¼ in. holes through ½ in. steel plate, which it did in thirty seconds, and in rimering out ¼ in. holes to ⅜ in. Messrs. Muir & Findlay's works are fitted up with a complete installation supplied by Messrs. Taite, Howard & Co., through their Scottish agents, Messrs. John Macdonald & Son, 180, Hope Street, Glasgow, under whose superintendence these exhibitions were carried out. This firm have at present on hand several large installations for marine engineers, boilermakers, and shipbuilders throughout Scotland.

Messrs. James Bennie & Sons, of Clyde Engine Works, Polmadie, Glasgow, who are so well known for their productions in the way of heavy machine tools, for punching and shearing work especially, will shortly remove to more extensive premises in the Govan district. The firm have for some considerable time past experienced a strong demand on their resources for producing machines of heavier and heavier calibre, especially for shipyards and boiler works abroad.

The proposal to hold an International Fisheries Exhibition at Aberdeen next year has been abandoned. The Finance Committee early in the month reported to a general meeting of the promoters that as the committee had failed to get the necessary guarantee fund up to £40,000, it would be impossible to proceed with arranging for an exhibition next year. The guarantee fund it appears had reached £37,000, but at that stage nine guarantors of £500 each withdrew their guarantees on account of the scope of the proposed exhibition having been widened. Consequent on this, the guaranteed fund would be reduced to such an amount that would entirely prevent the £40,000 aimed at being raised in time. The excuse given by the nine guarantors for withdrawing was the widening of the scope of the exhibition originally intended for Fisheries only. This, however, the committee thought really made the risk to guarantors all the less. The action of those who had withdrawn has been severely commented upon, especially in view of the fact that efforts were successfully made some time ago to get the Queen to extend her patronage to the exhibition.

The executive committee of the Federated Engineering Employers are having prepared, and will soon issue, in complete form, a Trades' Directory concerned with the trade specialities of all the firms within the Federation. The book, of which advance copies have been sent to all the firms for correction, consists of a list, alphabetically arranged, of the names of firms federated, the nature of their business, and their telegraphic and telephonic addresses. But the major, and probably the most useful, portion is that in which the whole of the federated firms —somewhere between 700 and 750 in number—are classified according to their trades, and all alphabetically arranged. Some idea of the variety and scope of the trades represented may be gathered from the fact that the work contains some 600 trades headings and very numerous sub-heads, the names appearing under the various heads in many cases extending over several pages, although set in very small type. The main object in issuing the work is to familiarise the members of the federation with each other's specialities and control custom as much as possible within federated channels. This doubtless will have the effect of cementing and strengthening the cohesion of interests attained through the organised resistance to the 48 hours movement. A very large large edition of the work will be printed, as many of the firms will distribute the book extensively amongst their customers all over the world.

Excessive speed on the Clyde has not been hitherto so fruitful a subject of comment and litigation as several other restricted and busy channels, but it has now been brought prominently forward, and curiously enough the parties alleged to be at fault are the very authorities who legislate and lay down rules for the discouragement and prevention of excessive speed, viz., the Clyde trustees. An action has been raised in the Glasgow Sheriff Court, before Sheriff Strachan, by Messrs. Paton and Henry, steamship managers, 60, St. Enoch's Square, who are interested as managers or otherwise in between 30 and 40 steamers of the coasting type, who seek to have the trustees of the Clyde Navigation interdicted from plying within the limits of the harbour of Glasgow passenger, steamers, ferries, or other vessels belonging to them at a speed exceeding five knots an hour. The pursuers state that by the rules and regulations issued by the Clyde Trust it is provided "That the master or other person in charge of any steam vessel passing up or down any point of the harbour between Glasgow Bridge and river Kelvin shall reduce the speed of the engines to 'dead slow,' which means a speed not exceeding five knots an hour, and they allege that the defenders permit their harbour steamers *Cluthas* to be run at a rate of from ten to twelve knots an hour, notwithstanding the immense quantity of traffic which blocks the harbour and thereby provide a source of great danger to the shipping. It is alleged that in June last the pursuer's vessel *Easdale* was run into while moored in the harbour and sunk by one of the *Cluthas*. Defendants pleaded that the section of the regulations referred to does not apply to the navigation of the *Cluthas* within due limits of the harbour, and that the accident referred to was not caused through the speed of the *Clutha*, but through a temporary latent defect in the engines over which they had no control.

THE TYNE.

(*From our own Correspondent.*)

Shipbuilding.—Orders for steamers for special trades are still being booked pretty freely, but in most cases shipbuilders require practically a free hand in the matter of delivery. At all events, they are not, as a rule, willing to guarantee delivery before the end of 1899, and in some cases not till the summer or autumn of 1900. The prosperous state of the shipping trade is still indicated by the absence of laid up steamers, from the river and docks, and also by the maintenance of remunerative freights in most of the principal trades. There can, indeed, scarcely be a doubt that fair profits are being realised now by shipowners, and so long as this continues the outlook for the shipbuilding industry must be healthy.

Referring to the proposed great graving dock on the Tyne, mentioned in last month's Notes, it would seem that some delay is likely to occur before this most necessary work is entered on. The Wear Commissioners have been approached by Messrs. Armstrong, Whitworth & Co. on the question of making a dock, suitable to the requirements of the latter company on the Wear: but in this case, we understand, the proposal has fallen to the ground. The Elswick Co. must therefore revert to the Tyne for the realisation of their wishes in the matter of a dock, and it is indeed strange why they should ever have thought of getting their purpose served anywhere else. It is not at present clear who will undertake the responsibility of carrying out the work, as the Tyne Commissioners appear to hesitate, and the Elswick Co. are evidently averse to undertaking the work on their own account. Probably some scheme of joint responsibility will be entered into by the company and the Commissioners, under which the work of making the dock will be entered upon and successfully carried through. We do not doubt that before the century is ended the work will have been commenced, and the opening years of 1900 will find in full swing the project of providing for the Tyne a dock capable of accommodating the largest vessels afloat.

Trade at the Dunston coal staiths, which were only erected a few years ago, has developed so rapidly that important extensions have now been decided upon by the directors of the North-Eastern Railway Co. A tidal basin is to be formed, and a river wall constructed; besides which very extensive dredging is to be proceeded with, so as to enable steamers to load at the staiths of a much larger tonnage than could hitherto be brought alongside.

The announcement that Sir Christopher Furness has become associated with the Palmer Co. has excited considerable interest in commercial circles, as it is felt that the incident means a new era of prosperity for the great Jarrow works. Sir Christopher Furness will doubtless have a voice in the management of affairs, and it is most certain that whatever he advises will be well considered, and likely to lead in the direction of success. All the enterprises with which this gentleman has so far connected himself have prospered beyond anticipation, and there is no reason to think that the Palmers' Co. will prove an exception.

At the Jarrow yard business continues active, there being half a dozen large steamers on the stocks and almost as many in the water, getting fitted out. The graving dock and slipway are occupied with vessels under repair, and this department of the works is likely to be kept busy during the winter.

An order for a vessel to be 535 ft. long, and of proportionate dimensions in other respects, has been placed with Messrs. Hawthorn, Leslie & Co., by Messrs. Leyland & Co., Liverpool. The vessel is similar to others buildings for the same owners by Messrs. Harland and Wolff, Belfast, and is intended for the Atlantic trade. She will be equipped in a thoroughly up-to-date style, and will have accommodation for a limited number of passengers.

The alterations to the shops, &c., the electrical installations for power transmission, and other improvements, which are being carried out in this firm's shipbuilding department at Hebburn, are now well advanced towards completion, and the increased facilities for production which will be provided will doubtless be available in the building of the large vessel referred to. It is understood that the firm have a number of other exceptionally important orders, and in this case, at all events, briskness is assured over the whole of next year.

No falling off of activity is to be noticed at the Elswick yard of Messrs. Armstrong, Whitworth & Co., and at the Low Walker yard, all the berths are full. It is announced that an order has been received from Messrs. M. Samuel & Co., for the construction of three steamers to be 412 ft. long by 52 ft. beam, and capable of carrying 9,000 tons of oil each. They are to be of exceptionally light draught, and are to have large power, to steam 11 knots. The building of these vessels is to be commenced at once, and it is thought that one, or perhaps two of them will be put down at the company's Elswick yard.

Messrs. Wigham, Richardson & Co., have a number of important orders in hand, and all departments of the yard are kept going briskly, night and day shifts being kept on at the frame turning.

There are two or three vessels receiving their final equipments, besides an old vessel of large size, undergoing repairs.

The extension works at this yard have been commenced, and satisfactory progress has already been made.

Messrs. Dobson have three vessels on the stocks and two in the river being fitted out, and at Messrs. Wood and Skinner's establishment all the berths are occupied. Messrs. Robert Stephenson & Co., are reported to have booked some further orders; but if the report has any basis in truth, the orders must have been accepted on the condition of a more than usually prolonged term being allowed for delivery, as the firm's building space appears to be fully occupied, and it is known that the firm have other work not yet entered upon, at least so far as outside operations are concerned.

It is understood that a work of unusual interest is about to be undertaken at the yard of Messrs. C. S. Swan & Hunter. This is the construction of a new forward section to be fitted to the s.s. *Milwaukee*, now in the Wallsend Slipway Company's graving dock. The *Milwaukee*, though requiring such an extensive repair, is practically a new steamer, as she had only entered upon her first voyage, when through a miscalculation or misunderstanding on the part of those in charge, she was stranded on some rocks off the coast of Aberdeen. While on the rocks, and before salvage operations were commenced, the forepart of the vessel was almost completely broken up, so that it was deemed advisable in taking the vessel off to deal with the comparatively uninjured portion, *i.e.*, the after and midship sections combined. In this way the *Milwaukee*, or what remained of her, was brought to the Tyne and placed in the graving dock as stated. When the new forward section is completed by Messrs. Swan & Hunter, it will be floated down to the Slipway Company's dock, where it will be fitted to the other portion of the vessel. Such a repair, we believe, has not been attempted hitherto, and its successful carrying out will add another to the many remarkable achievements in shipbuilding, pontoon building, and ship repairing, which stand to the credit of this firm. The *Milwaukee* was built by Messrs. Swan & Hunter, and was one of the finest cargo boats ever launched on the Tyne.

The s.s. *Knight Errant* is undergoing a very extensive repair in the graving dock of the Wallsend Pontoons Co., after having been stranded on the Northumberland coast early in September. This vessel is also new, having been built in the present year on the Clyde, and is practically of the same tonnage as the *Milwaukee*. We understand that certain parts of the interior structural arrangements which had been coated with Wailes & Doves Bitumastic enamel, and was for a considerable time under water, were found to be in an excellent state of preservation, the enamel adhering as firmly as when first put on.

It is understood that Mr. J. T. Lunn, of Newcastle, has ordered a large vessel from the Northumberland Shipbuilding Co., the machinery for which will be supplied by a Tyneside firm of engineers. The Tyne Shipbuilding Co. continue to have as much work in hand as they can deal with, and at Messrs. Readhead's establishment the customary briskness is maintained.

Engineering.—At all the large engineering works evidence of great activity are apparent, and night work (in addition to the ordinary day work) continues to be the rule. Vessels are being fitted with their machinery at almost all the marine engine works, and with the improved appliances now in general use, the work of fitting engines, boilers, &c., occupies but a fraction of the time that had to be devoted to it a few years ago. There are consequently not so many vessels awaiting "turns" as might have been expected, under the existing conditions of shipbuilding, and it is quite safe to say that had there been no strike last year, there would not now have been any vessels waiting to be fitted, as under normal conditions the engine works of the district are quite capable of keeping pace—in productive activity—with the shipyards.

Messrs. Isdale & Farrow, of No. 4, St. Nicholas Buildings, Newcastle, the representatives in this district of the Roller Bearings Co., Limited, are exerting themselves to get those bearings into use in steamships, and are, we believe, now engaged in negotiations to effect this object with certain firms in the North. From what we hear of the working of the roller bearings in tram-cars, railway cars, motor cars, and workshop machinery, we cannot but think that they would be admirably adapted to steamers' shafting. The principal merits claimed for these bearings are that they assist motion, increase speed, save oil and fuel, give an absolute immunity from heating, and prolong the life of the shaft.

Langridge's Patent Regulator for steam heating purposes is attracting a good deal of attention just now, and the agent, Mr. H. M. Wilson, Crown Buildings, Side, Newcastle, has booked a good many orders lately. The advantages claimed for this appliance are—saving of steam, so much of which is wasted under present conditions of heating; simplicity of construction, so that there is nothing to get out of order, or to require looking after; self-cleaning and absolutely automatic. It can be adjusted very simply to retain the water of condensation in the pipes to any temperature desired. Any volume of condensed water can be blown off most rapidly, without the slightest loss of steam, which follows up the water and is checked immediately it reaches the outlet valve. The steam cannot pass until the condensed water is again present in sufficient quantity at a temperature arranged for by those in charge. The apparatus appears to be particularly well adapted to the purposes intended, and should, when its merits become sufficiently known, find a very general acceptance from engineers.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—Sir James Laing has followed the example so widely set by leading shipbuilding and engineering firms, and converted his business into a limited concern, under the style of "Sir James Laing & Sons, Limited." The capital is to be £300,000, in £10 shares, no portion of which, we believe, has been offered to the general public. We don't suppose the alteration mentioned will involve any departure from the more recent policy of the firm, which has been one of continual expansion. When the extensions of buildings and machinery equipment, which are now being carried out, are completed, we believe there will be few shipbuilding establishments in the kingdom to equal this in point of productive capacity and general convenience.

Messrs. Short Bros. are putting down some further plant in the additional premises which they acquired some time ago, but have not as yet very largely utilised. Among the new accessories may be mentioned a special type of travelling crane, and some powerful punching and shearing machines. We believe that the machinery in these added premises, as well as that in the shipyard proper, will be driven by electrically transmitted power.

Messrs. John Priestman & Co. have received from a Norwegian firm an order for a 6,000 ton steamer, the machinery for which will be supplied by Messrs. Wm. Allan & Co. The berths are now fully occupied, and general activity exists in all departments. The other yards above bridge, are, all showing continued briskness, and those in the lower reaches of the river present an appearance equally satisfactory.

Messrs. J. L. Thompson & Sons have their berths fully occupied, and it is a long time indeed since they have been otherwise. There are not many firms in the kingdom which, over a term of years, have maintained such uniform activity as that which directs the destinies of the North Sands Yard, and if output were to be computed by a comparison of what the different yards produced in the present decade, or in decades past, we think the North Sands establishment would stand easily near the first.

Both the yards at the South Dock, are kept busy, and in the repairing works a fair share of business is being done. In the building of ship's boats there appears to be a little more activity, and it would seem that in the opinion of those best entitled to express one on this subject, wood is a better material for ship's boats, than steel. This opinion is qualified, however, by the condition that the wood used has undergone a thorough seasoning, so as to be, in a sense, unshrinkable afterwards. The principal firm in this line, now on the Wear, is Messrs. Robson & Sons, Monkwearmouth, and the bulk of the work now being done is in their hands. The demand for timber, for shipbuilding purposes, is just now pretty brisk, and the firm last mentioned are busily engaged in supplying local requirements.

Engineering.—It would be difficult to say which of the Sunderland marine engineering firms are the busiest, all being as full of work as anyone connected with them could wish. In addition to the engining of vessels, Messrs. John Dickinsons have an extra pressure upon their resources by the very strong demand which exists for the firm's patent crank shaft, which is being supplied to numbers of steamers at the present time. We understand that the firm have ordered Deighton's patent furnaces for the boilers of some half dozen of the vessels they have to fit with machinery, and the probability is that they will order many more in the future. This furnace has been tested under Board of Trade regulations against two other patent furnaces, which are now much in use. Deighton's furnace was found to have a much higher resisting power against possible collapse than either of the others, and when we add to this fact the other equally favourable circumstance that the price is considerably lower, it will be seen that there is little to stand in the way of its very wide adoption.

At the local ironworks and foundries business continues brisk, forges having as many orders as they can possibly deal with. Messrs. W. L. Byers & Co., makers of the "Reliance" stockless anchor, have issued a booklet containing a list of steamers to which they have supplied anchors, and state that they continue to receive excellent reports from shipowners and captains as to the advantages of this type of anchor. They express the belief that the mushroom-shaped crosshead, which is a special feature of the anchor, has materially contributed to its success.

The Hartlepools.—It is stated that Sir Christopher Furness has acquired by purchase the fleet of the West Hartlepool Steam Navigation Co. Five large steamers have been taken over, and it is understood that the fleet will be strengthened by the addition of some new boats yet to be ordered. The timber trade at this port is just now very brisk. Arrivals are numerous, and work on the quays is very actively carried on. Discharging berths are at a premium, for all available space is covered to a great height with deals and boards. Pitwood is very strongly in demand, and it is fortunate that the supply is being constantly renewed by new arrivals. Prices for red wood, deals, etc., are firm, and are likely to go higher. Pitch pine timber is also in good demand, and some very heavy lines are being despatched. White wood prices are low, and holders of large stocks have not an encouraging prospect to look forward to.

Stockton.—Shipbuilding and marine engine building are still brisk, and cognate industries, such as steel works and foundries, have as much work as they can deal with. A rumour was current some few weeks ago to the effect that the old Westbourne Ironworks, which have been closed for some years, were about to be reopened. The hopes to which the rumour gave rise, are now, however, being somewhat rudely dissipated by the circumstance that the works are being dismantled.

Middlesbro'.—Messrs. Craggs & Sons, and Sir Raylton Dixon, are both having an abundance of work, and business at the docks being also brisk, there is no unemployed labour now in the port.

Darlington.—Trade at this centre continues good, the works of the Darlington Forge Co. being particularly busy. The work in hand comprises cast steel and wrought iron stern frames, and rudders for vessels building on the Clyde and at other important centres, besides propeller blades, cranks, piston and connecting rods, screw, shafting, &c., for engineering firms in all parts of the kingdom.

THE MERSEY.

(From our own Correspondent.)

IN the marine and general engineering and shipbuilding industries of this district exceptional activity continues to be reported. The leading firms are not only fully engaged for some time ahead, but more new orders are offering than they can entertain for anything like early delivery. This is especially the case amongst makers of high class machine tools, both for general and marine work, boiler makers, stationary and locomotive engine builders. During the month there have been important enquiries on the market for locomotives, and several of the leading firms have been unable to quote except on the condition of not putting work in hand before the end of next year. The only branches in which any slackening off is noticeable is here and there in the lower class departments of tool-making, and, as previously reported, some sections of the textile machine making trade.

The usual monthly returns issued by the trade union societies continue to bear evidence of the activity throughout the engineering industries. The Steam Engine Makers' Society which has only ¾ per cent. of its total membership on donation, has practically a clear unemployed list in Manchester, Bolton, and Oldham. The United Machine Workers' Association has 3½ per cent. of the total membership on donation. In the Lancashire district, apart from Oldham and Bolton, where owing to special causes the proportion of unemployed is exceptionally large, there are only ¼ per cent. on benefit. Barrow, Blackburn, Lancaster, Crewe, and Wigan having clear books. In Manchester the returns show 2¾ per cent. on donation, but there has been a further reduction since these were compiled. Trade in all centres is reported as either good or moderate.

Messrs. Laird Bros., continue very busy on work in hand. During the past month the 30-knot destroyer *Orwell* was launched from their works, this being the fifteenth 30-knot boat of the destroyer class built by the firm, ten having already been delivered to the British, and four to the Chilian Government. On the 8th October, the paddle steamer *Princess of Wales*, built and engined by the firm, underwent her official trials on the Clyde with very satisfactory results. This vessel which has been built to the order of the South Eastern Railway Co., for their service between Folkestone and Boulougne, is 270 ft. by 32 ft. beam, and fitted with compound diagonal engines of considerable power. The trial was eminently satisfactory in every way, a mean speed of 19·1 knots being obtained on six consecutive runs on the measured mile at an average of about 47 revolutions. The speed was in excess of that contracted for, and there was an entire absence of vibration. The South Eastern Co., have, it may be added, ordered another larger and faster paddle steamer of the same type as the *Princess of Wales*. Other work in hand at Messrs. Laird's includes H.M.S. *Glory*, a first-class battleship of 13,000 tons, and 13,500 H.P.; H.M.S. *Express*, an experimental destroyer, of high speed; H.M.S. *Mutine* and *Rinaldo*, two sheathed sloops of the *Condor* type; a set of 15,000 H.P. engines for H.M.S. *Implacable*, a first class battleship that is being built at Devonport; also a high speed destroyer for a foreign government, all of which are being fitted with water-tube boilers. New boilers of the firm's latest type are also being made for H.M. cruiser *Blanche*. The firm have recently erected an additional shop, equipped with the necessary tools, for the construction of water-tube boilers.

The Ardwick Engineering Co. have in hand several compound surface-condensing launch engines, which are to be sent away to Russia and Finland. They are also making a number of launch engines of the "Compact" type recently described in these columns, for shipment to Calcutta, and are executing an order from the Falkland Islands for fitting up a launch with "Compact" engines, boilers, propellors, shafts, stern tubes, &c.

J. Hallsworth & Co., of Hyde, are introducing a new machine for screwing spring forks, and clips, and also ordinary bolts, rods, and tubes. and which supercedes the present method of bending back the forks, and using stocks and dies. The machine will screw all sizes from ⅜in. to 1 in., and is fitted with a hollow spindle, to enable any length of thread to be screwed. If required it can be supplied with gas thread dies up to 1 in. The length of the bed is 20 in.; width, 5 in., and weight 1¼ cwt.

The Heywood and Bridge patent friction clutch, made by Messrs. David Bridge & Co., Salford, is being applied to various special classes of machinery. The firm have in hand a 5 ft. clutch, and two 6 ft. haulage pulleys, with shaft, for a large colliery in South Wales, and a special form of the clutch has been designed for driving dynamoes, pumps, and other machines that require to be out of gear for long intervals. The clutch consists essentially of a shell provided with a boss, on which the pulley is keyed, and the central portion of the clutch is divided at two points, diametrically opposite to each other. By means of right and left hand screws, operated by levers and a sliding sleeve, the internal part is expanded when the clutch is in gear, and contracted when out of gear.

A very handy machine for drilling steel, iron, brass, &c., is being put on the market by Mr. A. T. Murray, Manchester. This tool goes by the name of Scaife's universal hand or power drilling machine, and one of its special features consists of two discs, with machined ends, which are movable to suit any angles to which it is required to set the drill. This arrangement also, it is claimed, renders the drill perfectly rigid, whatever may be the angle of working, The machine can be operated from the top or the side; in fact work can be done in any required position. The feed arrangement is in the form of a four cross handle.

The Manchester Association of Engineers opened its winter session on Saturday, the 8th. of October, by a visit to the grain elevator, which has been erected at the Trafford Wharf, by the Ship Canal Co., and over which the party was conducted by Mr. W. H. Hunter, chief engineer to the Co., under whose direct supervision the work has been carried out. The members afterwards adjourned to the Grand Hotel, and in the course of an interesting address, dealing with the construction of the elevator, and the object it was intended to serve, Mr. Hunter expressed the opinion that a new elevator of the same size as the one they had inspected, would probably be required every five years.

In the iron trade there has been a continued upward move in prices during the past month. Pig iron makers are now quoting fully 1s. to 2s. over the rates last given for most brands, and although this advance has tended to check buying in some quarters, there are considerable enquiries on the market, with a tolerable weight of business doing, and the outlook does not indicate any advantage to be gained by waiting. Lancashire brands still nominally remain at 47s. 6d. for forge, to 50s. 6d. for foundry, less 2½, delivered Manchester, but makers do not care to sell on the above basis, and the tendency is to stiffen up where quotations are asked on new business. Lincolnshire makers have raised their basis rates 1s. per ton on foundry numbers, and in some cases are quoting a further advance of 1s. over the official list; although there is no official alteration in forge qualities, makers here and there are asking an advance of 1s. per ton. Delivered Manchester, No. 3 foundry is now 48s. 6d. to 49s. 6d.; No. 4 foundry 47s. 6d. to 48s. 6d, and No. 4 forge, 45s. 6d. to 46s. 6d. nett, with Derbyshire foundry nominally quoted 52s. to 54s. net cash. Outside brands have shown a persistent upward move, and Middlesborough which is scarcely quotable for prompt delivery could not be brought under 53s. 1d. for good foundry qualities by rail Machester. Scotch iron now averages 53s. 6d. to 53s. 9d. for Glengarnock, and 54s. to 54s. 3d. for Eglinton, net., with American iron quoted 47s. 6d. to 50s. net., delivered Manchester docks.

The finished iron trade maintains a strong tone, and prices all round have been substantially advanced. Delivered Manchester, Lancashire bars are now £6 5s., with 2s. 6d. more got at Liverpool, and North Staffordshire qualities are quoted £6 10s. delivered Manchester. Sheets now average £7 2s. 6d. to £7 5s., and list rates for hoops, which have been put up 5s per ton, are now £6 15s. for random to £7 for special cut lengths delivered Manchester district, and 2s. 6d. less for shipments. Merchants in the Manchester district have raised their stock prices 10s. per ton on both manufactured iron and steel.

The steel trade continues exceedingly brisk, and prices move steadily upwards, makers and manufacturers being able to hold out practically for their own prices, at any rate where prompt delivery is required. No. 3 foundry hematites are now about 64s. to 65s. less 2½; local billets £4 11s. 3d. to £4 12s. 6d. net; steel bars £6 15s. up to £7; common plates £7 to £ 2s. 6d.; and boiler plates £7 10s. to £7 12s. 6d. delivered in this district.

An active demand comes forward on all discriptions of manufactured metal goods, especially for marine and general engineering, boiler making, and locomotive building requirements. This briskness of demand, with the upward move in raw material has led to an advance in manufactured goods. Brass and copper wire rolled brass and condenser plates have been raised ½d. per lb., and a similar advance in tubes is probable. Delivered in this district. solid drawn brass tubes are quoted on the basis of 7½; copper tubes 8¾; brazed copper tubes 8½; brazed brass tubes 8¼; copper wire 7¾; brass wire 6¾; rolled brass 6½; yellow metal plates 5½; and naval brass condenser plates 5¾ per lb.

Business in the timber trade is quiet, and although arrivals show some falling off, and deliveries have been fair, stocks are large and prices difficult to maintain. The import of teak has been moderate; there is rather more inquiry, and prices are steady. Only one cargo of Greenheart has arrived, but the consumption is small, and stocks are ample.

A steady business is reported generally in the coal trade, although there is no pressure of demand. House-fire qualities are only in moderate request, but prices are well maintained at the advanced rates. Steam and forge coals are in better demand than the higher qualities of round coal, owing to the activity in all the principal coal using industries, and prices are very firm at the full quotations. With regard to engine classes of fuel the position has varied somewhat, but the general tone is one of firmness, and the tendency of prices has been to harden up on late rates, especially on forward contracts. At the pitmouth best Wigan Arley is quoted 11s. to 11s. 6d.; Pemberton four foot and seconds Arley, 9s. 6d. to 10s. 6d.; common round coal from 7s. 6d. to 8s. 6d.; engine fuel 3s. 6d. to 3s. 9d. for common; 4s. 3d. to 4s. 6d. for medium, and 4s. 9d. to 5s. 3d. for the best qualities.

The shipping trade has slackened down considerably and only a moderate business is just now being put through, with ordinary steam coal obtainable at 9s. to 9s. 3d. for better qualities 9s. 6d. to 9s. 9d. delivered Mersey ports.

THAMES.

(From our own Correspondent.)

THE first boilers of the Blechynden type, which have been fitted in a cruiser, were on their trial on Tuesday, 18th October, and the result was all that could be desired. Unless in books and scientific papers these boilers, which were designed by the late Mr. Blechynden are little known, and it will therefore not be out of place if it be explained that they are of the express type and nearly of the Yarrow shape. There are three drums, the steam drum above, and two smaller water drums below, and these are connected in the usual way by almost straight tubes. The tubes are not quite straight, but slightly bent, so that they can all be withdrawn by a narrow door at the top. Tubes in the middle are thus straight, while tubes away from the middle are sligntly bent, so that they may be withdrawn at the top door. The further the tube is from the middle the greater is the bend.

When the boilers were first tried some little trouble was experienced. One of the tubes leaked for one thing, and besides that some little modifications were found necessary in their construction. At the beginning, and in accordance with the design, the hot gases were made to flow through amongst the tubes in the same way as they did formerly with Mr. Yarrow's boiler. Mr. Yarrow, however, has introduced a modification in his manner by admitting the feed. The feed with him, as we have seen above, is now led into the back three rows of tubes, and so the water is led up, and it can only move up the back three rows of tubes. The water moves slowly, it is the feed, and as it moves slowly it takes in a sufficient quantity of heat to raise its temperature to quite near the temperature of evaporation. Anyway, the circulation is better by making this division of work in the boiler. The temperature also of the flue gases is lower than it was formerly, and the efficiency of the boiler consequently higher. Formerly, of course, the circulation of the water was not so good. It had to seek a path for itself. When the circulation of the water was seen through experimental glass tubes the water generally flowed down the back ones and up those next the fire. But the water in the tubes at positions between those extremes hardly know which way to go. Sometimes it went down a tube, at other times it flowed up the same tube. Tubes were then alternately up-comers and down-comers. There was no direction of the circulation. Now it is different. The circulation is directed in proper channels, and what is more, the feed is heated by a very simple artifice, and more heat is extracted from the gases by the new arrangement.

Now the same difficulty was experienced with the boiler of the *Pactolus*. The water would rise all right in the tubes next the fire and go down all right in those tubes quite at the back, but in the tubes between, it was not quite sure which way to turn. Sometimes in a tube it went up, at other times down, so that alternately the same tube acted as an up-comer and down-comer. It was also surmised and, apparently with some reason, that the critical point was nearer the back than the front. When the water rises it does so as steam and water, where it descends it does so as solid water, and more tube area is required for up-comers than for down-comers. These were the reasons which led John Penn & Sons to make modifications in the design so as to guide the circulation of the water, and to choose for it in which tubes it should descend and in which it should rise. A different method was adopted from that by Mr. Yarrow. Mr. Yarrow directed the water, but John Penn & Sons have influenced the direction of the water by forcibly directing the flames.

A baffle plate has been fixed the full length of the boiler which touches the lower drum but leaves a space between the top of the baffle plate and the top drum. This baffle plate is also fixed so that it divides the tubes in a certain ratio. Two-thirds of the number of tubes are on the grate side of the baffle plate, and one-third of the number on the outside. It is meant that the hot gases should circulate amongst the two-thirds first and then go over the top of the diaphragm, then down the other side, circulating amongst the outside third. The outside third are thus down-comers and the two thirds next the fire up-comers, and so the water is given a direction of motion, and the circulation goes in its proposed direction, and all the tube surface is utilized, none of it with dead unmoving water in it.

Since this modification in the construction has been introduced the boilers have worked well, and the result of the trial of the *Pactolus*, as reported by the Admiralty, is that it is the highest recorded I.H.P. for a vessel of her class. The first trial was on Tuesday the 18th, and it was in the teeth of a rough sea. Her draught forward was 11 ft. 9 in., aft, 15 ft. 8 in., in speed, 20·5 knots. The steam pressure was 253 lbs.: the air pressure in stokehold, 3·3 in., vacuum of condensers, 23·2 in. The revolutions of the starboard engines were 216·1, and the port engines. 223·9. The mean I.H.P. for starboard engines was 3,639, and for port engines, 3,562, making a total of 7,201. She did rather more than was asked for in the contract, by which 20 knots speed was required with 7,000 I.H.P.

Yarrow & Co.'s have been making modifications in their boilers, which will lead to a much higher efficiency being attained. It will be remembered by those who witnessed the experiments made by Professor Watkinson with his water-tube boilers fitted with glass ends and glass tubes, that difficulty was experienced by the water in some of the intermediate tubes is finding out whether it should flow up or down. The gases it is known flow from the grate right through amongst the tubes and rise at the back of them to the up-take. The gases are therefore hottest on the grate side, and cooler on the outside. The water for its part therefore easily rises in the tubes next the fire and falls just as easily in the tubes immediately on the outside. The difficulty is with tubes in intermediate positions. In the experiments made by Professor Watkinson, and even by Mr. Yarrow himself, it was seen through the glass tubes that the water was not at all sure in which direction to go. A tube in particular intermediate positions sometimes served the office of an up-comer, sometimes a down-comer. It was a trouble, but a remedy for this state of matters was not discovered, and it was then thought and held that the condition of things was quite as good as they could be. Competition was pressing, and Mr. Yarrow is ever resourceful, and he hit on a modification. His modification was to divide the tubes on both sides of his boiler into two parts. The three back rows of tubes he has now separated off from the main rows. This is done by fixing a division plate in the lower drum so that it divides it into two parts—one part communicates only with the three back rows, while the other part communicates with the main front rows. The division plate runs the longitudinal length of the lower drums. Into the back part which communicates with the three back rows only Mr. Yarrow now introduced the feed, and so the direction of motion by the water in the back three rows of tubes is always upwards, and these three rows are simply feed-water heaters. By the time that the water in them reaches the top drum its temperature is fairly high, probably not far from the temperature of evaporation of the boiler. The water then reaches the other tubes at a high temperature allows them to be always in use as evaporators. The water in those is not of a mixed kind. It is always at the boiling temperature, and so the part of the boiler next the fire and in communication with the divisions of the lower drums next the fire is simply an evaporator. All the heat which it receives goes to evaporate water; it does not go to heat the water up to the point of evaporation. The consequence is a greatly improved rate of circulation in the fire side division of the boiler, and on an average over seventy degrees greater difference in temperature between the gases on the inner side of the tubes and the gases on the outer side. There being a greater difference of temperature and a lower funnel temperature, it means a greater amount of heat taken from the gases, and consequently a higher efficiency of boiler. This then is the new feature of Mr. Yarrow's boiler, a division of the work of transmission into two parts, one for water heating, and the other for steam raising.

Mr. Northcott, of the General Engineering Co., and author of the popular work on the steam engine, intends relieving the work put on his Scotch cylindrical boiler by the water-tube boiler which he is now fitting into his boiler shop. At present, when tests are going on, the steam off the Scotch boiler is wholly taken up with them, and the shafting of the shop has to be run with a gas engine. In future it is expected there will be sufficient steam from the two boilers to supply both tests and the shop steam engine. The new boiler is of the water-tube type, and after Mr. Yarrow's pattern. There is a drum above parallel with the front of the boiler, and this drum is made of cast steel. The tube plate is flat. At the bottom there is the water drum, also with a flat tube plate, and in the front of this drum is the grate. The water tubes are straight, and are inclined at an angle of 45 deg. From the ends of the upper drums there descends the down-comers in a vertical direction, and they are jointed on to a vessel which acts as a purifier. The feed is pumped into this. A pipe leads from the purifier to the lower drum, and so completes the path of circulation. There are two fire-doors, and the setting is brickwork. Forced draught will be produced by leading the exhaust steam into the iron chimney. The boiler has been tested with a hydraulic pressure of 600 lbs., and it is intended to work up to a pressure between 250 and 300 lbs.

Messrs. R. & H. Green have now completed the engine trials of the *Conservator* for the Thames Conservancy. They are this week to put the steam steering gear through its trials. The *Trinity* lightship is still under weigh in their yard.

There have been rumours going the round lately with regard to the floating of the Belleville boilers as a limited liability company. The capital was to be £1,200,000, of which £400,000 was to go to Messrs. Maudslay, Sons & Field in payment for their interest in it; £100,000 for their Greenwich works; and £320,000 to M. Belleville, and the remainder to be distributed differently. The estimates of profits are on quite as grand a scale. And these were naturally to depend on Admiralty work. It is said that Messrs. Seaton and Beardmore have withdrawn their names from the promoters. The prospectus says that on "December 31st Messrs. Maudslay, Sons & Field had contracts for 86 Belleville boilers and their appurtenances on hand, and for parts of 44 others to the value of about £205,000, of which about £57,000 had been executed." Also, "Since January 1st, 1898, his company had secured further contracts to the value of about £70,000." It also says: "The Belleville boilers are now adopted by every important naval power in the world, and are specified for, to the exclusion of all others, by the British Admiralty for all the larger classes of ships." A sample of the royalty paid is as under:—

British Admiralty.

	Total Royalty.	I.H.P.
H.M.S. Powerful (1st class cruiser)	£5,200	25,000
,, *Arrogant* (2nd class cruiser)	£2,093	10,000
,, *Diadem* (1st class cruiser)......	£3,455	16,520

The total royalty payable to the company, to accrue from December 31st, 1897, was given at £48,500.

The prospectus goes on to say: "There is also an unlimited opening for the introduction of the Belleville boilers for use in the mercantile marine, and for land and stationary engines . . . there has been no serious attempt to deal with this business in this country." The prospectus has been withdrawn.

Messrs. Babcock & Wilcox have several orders for ships in the mercantile marine to be fitted with their boilers. The General Power Station of New York is having boilers to supply engines of 44,000 I.H.P. fitted at their central station.

BELFAST.

(*From our own Correspondent.*)

SINCE our last report of the wages question amongst the moulders in this district, a settlement has once again been arrived at, the men having received an advance of one shilling all round, with a further promise for the future, and all are again at work. The partial strike of carpenters which occurred in Messrs. Harland & Wolff's has also been adjusted, although a great number of men left the town for other parts; accordingly good workmen cannot be got at present, especially ironworkers, whilst rivetters and regular working squads are in great demand. The effects of the late engineers' strike are still visible by the number of steamers which are being launched whilst there is yet no machinery with which to fit them out, although night shifts are still working in both the large marine shops.

The s.s. *Manhattan* recently launched [by Messrs. Harland & Wolff for the National Steamship Co., Limited, of Liverpool, has left this port for Liverpool to receive her engines and boilers from a local firm there. This vessel is 500 ft. long by 56 ft. beam, and has a gross tonnage of about 8,000 tons. She will be propelled by two sets of triple-expansion engines, and will be fitted throughout with electric light, and all the latest improvements for the loading and discharging of cargo.

The s.s. *Bay State* built by the same firm for Messrs. George Warren & Co., of Liverpool, has also left this port. She is a vessel of about 7,000 tons gross register, and is of the following dimensions:—Length, 490 ft.; breadth, 52 ft.; depth, 36 ft. 4 in. She is fitted with triple-expansion engines also constructed by her builders. This vessel has been built specially for cattle trade in the Western ocean, and has been fitted with all recent improvements for such, including electric light, &c.

The s.s. *German* also built by Messrs. Harland & Wolff for the Union Steamship Co., of Southampton, is nearing completion and will shortly leave Belfast, but further particulars concerning her will be given in next report.

The s.s. *Sabine* which was recently purchased by the Union Co., has undergone a very extensive overhaul at the hands of Messrs. Harland & Wolff, and has now gone to take up her station.

Messrs. Workman, Clark & Co., Limited, have recently launched the large steamer *Quernmore*, which has been built for the Johnstone Line of Liverpool. This vessel is at present receiving her machinery, which is also being constructed by her builders. This firm have also launched the s.s. *Castilian*, built to the order of the Allan Line Steamship Co., Limited, of Glasgow, for their trade between Glasgow and the principal Canadian ports, and has been specially designed [to meet the requirements of a first-class passenger, cattle and cargo trade. The *Castilian* has a gross tonnage of 7,000 tons, and the following are her dimensions:—Length, 470 ft.; breadth, 53 ft. 9 in.; depth, moulded, 36 ft. She has been built under the special survey of the British Corporation of Shipping, Glasgow, and takes their British Standard class, and in conformity with the Allan Line custom, a considerable amount of extra strengthening about classification society's requirements is introduced. She has a double bottom for water ballast. And also one of the cargo holds is subdivided, forming a deep ballast tank, which gives nine watertight compartments, which is somewhat above the ordinary requirements. There are three complete steel decks extending fore and aft, and above the upper one a permanent shelter deck from stem to stern, with a bridge deck above. The *Castilian* will carry a cargo of about 8,400 tons; for quick despatch and rapid handling of this large cargo, ten derricks with powerful winches are fitted. As this vessel will also carry a large number of passengers, a considerable portion of her has been fitted up for their accommodation, the first-class portion being placed in bridge house amidships. The dining room extends across the vessel and is seated for 100 passengers, whilst the fittings are of a most substantial and luxurious kind. The comfort of the passengers has been well considered, the state rooms being supplied with everything to suit the modern taste, several of the rooms are arranged with two berths only, others for four, but the majority are suited for only three passengers, and are heated throughout by a perfect system of steam heating, which is introduced into every class of living and sleeping apartment without distinction. The promenade on upper deck gives an uninterrupted walk of 150 ft. on each side, this being about 29 ft. above the sea and well protected from the spray. The second class rooms are on the main deck, and the dining saloon for this class is seated for 150 persons, whilst accommodation has also been provided for a large number of steerage passengers. A large refrigerating plant with powerful electric light plant will be fitted throughout the vessel and steam pipes are introduced into all the holds for fire protection. She will be supplied by her builders with ample engine and boiler power to give her a high rate of speed and when finished she will certainly prove a magnificent addition to the already numerous fleet of the Allan Line.

The s.s. *Rippingham Grange* also built by the same firm (Messrs. Workman, Clark & Co.) for Messrs. Houlder Bros. & Co., underwent her trial trip in Belfast Lough a few days ago, after which, everything having proved satisfactory, the vessel left to take up her station in the South Australian trade, for which she is particularly fitted and equipped. Her dimensions and power are exactly similar to the s.s. *Langton Grange*, which was built by the same firm some time ago, and which has just received some alterations and an overhaul at the hands of her builders, and will resume her station in a few days.

The same firm have also had the s.s. *Glenarm Head* of Belfast in dry dock here for some weeks, as extensive damage had been done to her bottom caused by her being ashore on the coast of America some months ago.

All this amount of new work and repairs to these large vessels gives any amount of employment to all the various branches of marine engineers and shipbuilders at this port. Our land engine makers are also able to compete outside their own sphere, as the firm of Messrs. Victor Coates & Co., Limited, have secured an order for a large set of triple-expansion engines for a Liverpool firm, and also a set for Bradford.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—Barrow, in common with all other shipbuilding centres is passing through a period of unexampled activity in trade, but in the case of Barrow this fact is all the more forcibly accentuated because, just prior to the general improvement in the demand for new tonnage, the Naval Construction Works were acquired by Messrs. Vickers, Sons & Maxim, with the object not only of enabling them to extend the other branches of their business but of developing the shipbuilding industry of Barrow on broad and comprehensive lines. The effect of this policy is being shown on every hand, not only in the shipbuilding industry itself but on the town and district generally. As stated on previous occasions in these reports the presence of Vickers, Sons & Maxim at Barrow, has given a marked local impetus to trade generally, and has furnished a high degree of stability to the town. Gradually more and more men are being employed at the shipyard, and at other minor industries in the town. By degrees the house property vacant in the town was all filled up, and now there is need for an additional thousand houses to be provided, a work which is proceeding apace. So acute is the need of house property in Barrow that the Furness Railway Co. have found it necessary to establish a system of workmen's trains in order to give facilities to working men living at Ulverston and at Dalton to come into Barrow sufficiently early to start work at six o'clock in the morning. No sooner had Messrs. Vickers acquired the Naval Construction yard at Barrow than they proceeded at once to make very important extensions, particularly in the engineering department, and gradually further enlargements have been decided on with a view of completing the equipment of the works to deal with a vastly greater volume of work. Especially so is this the fact in reference to the arrangements made and in progress to extend the business in the building of warships. In connection with the 9·2 in. and 12-pound guns made at Sheffield a very large bay has already been added to the engineering shops for the manufacture of gun mountings. This will employ a considerable number of hands, and already some very valuable and modern machinery has arrived in order to deal with this special work. But it has been found necessary to extend the engineering works in two other ways, first of all by the removal of the smaller and lighter fitting work to a special shed now building for the purpose, where the use of the powerful overhead cranes is not required, giving the available space to heavy engine work, and secondly by the building of a new template shop, and making this a separate department. In the shipbuilding department great extensions are also being made to the shops, and important additions are being made to the machinery. It has also been decided to make another permanent berth for the heaviest type of warship, so that the company can have at least six monster warships building alongside of each other. At present they have four of this type of ship in hand, and berths are now open for two more. To enable the company to tackle such a big programme of work at one time it will readily be seen that the machines and appliances in the yard alongside will necessarily have to be of considerable magnitude, and to this end the policy of the company is steadily directed. Originally the yard was schemed and planned with a view of being able to deal with a much larger volume of business than was ever done even in the busiest of times. It remains for Vickers, Sons & Maxim to carry this idea out, and they are proceeding on the right lines to do so, and that before long.

The torpedo-boat destroyer *Avon* has gone through her trials satisfactorily in the North Sea. She attained a speed with the tide of 33·2 knots, and easily maintained above her guaranteed 30-knot speed on her official run. So successful was the trial, that Messrs. Vickers have been asked, with five other firms, to tender for the 12 additional 30-knot torpedo-boat destroyers which are about to be placed out to private builders by the Admiralty. The *Bittern* torpedo-boat destroyer has proceeded to Chatham for her trials, and her sister ships the *Leopard* and *Otter* have gone to the Clyde for the same purpose. It is expected they will go straight through without any difficulty, as with the experience the company has had with the *Avon*, the work of getting the rest through their crucial trials will be comparatively simple.

An effort is being made to complete the *Amphitrite* first-class cruiser this year. All her boilers are aboard, and her engines, which are completed, are being erected in the ship. A strong force of employees from the engineering and shipbuilding department are employed on the cruiser. Had it not been for the engineers' strike this cruiser would have been delivered to the Admiralty long before now. So soon as the *Amphitrite* can leave the docks, the *Vengeance*, first-class battleship, will be launched. This will probably be in January, or may be February next year. In the meantime the two Clan liners will have been completed and probably the two British and African steamers, when the operations of the company can be more fully directed than at present to the work of building warships. The frames of the first-class armoured cruiser *Hogue* are beginning to lift themselves, and preparations are being made to build up the keel of her sister ship, the *Euryalus*. In the meantime the berth is being prepared for the new Japanese battleship, and it is quite on the cards that long before she is launched orders will be in hand for other foreign governments.

On the occasion of the launch of the *Clan Ferguson*, a turret-decked steamer for the Clan Line, two of which are building at Barrow, and the first of this type of vessel ever built here, Sir Charles Cayzer, M.P. for Barrow, and the managing owner of the Clan Line, took occasion to refer to the great amount of activity now observable at the Barrow yard. He was glad to see that although at one time the Naval Construction Co., the predecessors of Messrs. Vickers at the Barrow yard, were glad to get commercial orders from himself and others to keep the yard employed when work was not plentiful or easy to get, they were now very fully employed in warship construction. He hoped this would continue and that good commercial orders would come to them as well. He pointed out that the new owners of the Barrow yard were the only people in the world, save the Elswick firm, who were able to complete the largest warships from their own resources. Mr. Adamson, the managing director of the Barrow yard, put Sir Charles Cayzer right when he stated that Vickers, Sons & Maxim were the only firm in the country that could build a warship from their own material, including armour plates, fix them up with their own make of engines and guns, big 12-pounders or quick-firing guns, store them with their own make of ammunition and complete them ready for immediate service out of the resources they had at their own command in the several branches of their big business. This fact is already showing itself in the growth of the business of the firm with foreign governments, the first order being the Japanese battleship, which when completed will be the absolute output of Vickers' vast concern. It is generally believed that although a deal of work has been done by the Barrow Co. for the Clan Line, its operations in the future will he directed more to the building of warships than to the construction of commercial tonnage, although it is certain the Barrow firm will tender for any high-class ships that may be required by the great ocean lines, or for the fast Channel steamers, the examples of which from the Barrow yard have proved to be so excellent in every way. It is also certain that some fine steam yachts will also be built at Barrow in the future, but the tramp class of ship will probably have to find their genesis where the equipments of the building yards are of a class where work can be done at a lower tonnage price.

One of the early needs in the shipbuilding trade of Barrow will be found to be a big graving dock capable of taking in vessels of very heavy tonnage and very great length. Facilities for two docks of this sort will probably be found in the extension of the present graving dock at Barrow, and the construction of a new entrance to it from the Devonshire Dock, and secondly, in using the present entrance dock to the Devonshire Dock as a graving dock. In the latter vessels of 500 ft. long could easily be accommodated. There is talk of something being done in this direction, as well as of certain extensions to Vickers' yard outside their present boundary. There is plenty of scope and accommodation for these extensions, and before many months are over something more definite will be known of the schemes that are now in the air.

Messrs. Vickers are having some trouble with their apprentice platers, some of whom left work on a question of wages, and hold that their apprenticeship commenced under the old company is not binding on them with the new company. The lads, it appears, have been earning a deal of money, and some of them have contracted matrimony on the strength of it. The masters claim that the lads must finish their apprenticeship, or they cannot be taken on as journeymen at any of the yards of the Associated Employers. It is found necessary to bring these lads under stricter discipline, and probably before they return to work means will be devised to enable the lads to complete their apprenticeship on a footing more befitting their position and more satisfactory to their employers.

Additional accommodation is being provided at the Barrow Yard for the Admiralty department, whose representatives as inspectors are increasing as the work entrusted to the firm increases. It is found necessary to build them new offices at the engine side, and to give them increased accommodation on the shipbuilding side. Further than this it has been found necessary to provide a new ordnance department in the engineering works, and already a special staff of draughtsmen are at work here, in addition to the staff at the London offices in Victoria Street under Mr. James Dunn.

Some idea of the work in the hands of Messrs. Vickers, Sons & Maxim, at the Naval Construction Works, may be obtained when it is said that it totals up in value to a figure well in advance of three-and-a-half millions of money, with every prospect that this figure will be increased before many months have passed.

West Cumberland.—There is a very steady trade in shipbuilding at the West Cumberland ports of Workington and Maryport, and although only small tonnage ships are built at these places, there is a good steady run of work. No engineering establishments are connected with the local shipyards, and when vessels are launched requiring steam, they go to other ports to be fitted up. At present Messrs. Williamson of Workington, and Messrs. Ritson of Maryport, are well off for orders. There has again been some talk about the resuscitation of the shipbuilding industry at Whitehaven, but there is every reason to believe this is only a ruse. Lord Lonsdale, who is the owner of the present shipbuilding yard, is willing to hand it over to any company that will give promise of restarting the place, and to this end expert direction will need to be allied to local capital.

Shipbuilding Material.—There is a very brisk demand for all classes of shipbuilding material, indeed the demand is much greater than the supply, although all the mills are working night and day. Local shipbuilders, as well as those on the Clyde, at Belfast, and at Birkenhead, draw big supplies of materials from the Barrow Steel Works, where heavy and light plates, angles, and sections, and heavy steel castings, are in considerable production. It is quite on the cards that the Barrow Steel Company will shortly extend its operations in the Siemens-Martin department, with a view of increasing its business in shipbuilding material, the market for which is so active at present, and likely to be more permanently so, now that Vickers, Sons & Maxim have brought into life a more stable position for the shipbuilding industry at Barrow. Barrow is admirably situated for a good and successful trade in ship plates, angles, &c., because steel is produced on the spot from the native ores, and because Barrow, being a port, can send cargoes of metal to other shipbuilding centres at a minimum cost of carriage. Indeed, if those who controlled the destinies of Barrow years ago, when steel came to the front as the material for shipbuilding construction, had done their duty, Barrow would have been one of the first places to go largely into this class of manufacture, instead of coming to the front now when the trade is largely centred elsewhere, and at places which do not afford nearly the some scope for successful working. Considerable extensions are being made in the steel-casting department of the Barrow Steel Works, and it is anticipated before long double the present tonnage of output will be realised.

The Hematite Trade.—During the month the hematite pig-iron trade has improved by leaps and bounds. Every week shows an increase in the demand, and an advance in prices. Mixed Bessemer Nos. are quoted at 56s. 6d. to 57s. 6d. per ton net f.o.b., and warrant iron has advanced to 56s. 1½d. net cash sellers, 56s. 0½d. buyers. Unfortunately the output of pig-iron is restricted by reason of the scarcity of iron ore, or rather the comparative smallness of the yield of iron ore owing to the fact that in recent years too little attention has been paid to the development of the mining resources of the district. The consequence is that at the present time the North-West of England is not taking that share in the general prosperity which ought to have been the fact, and a good opportunity is thus being lost.

Shipping—The returns of shipping during the month are indicative of the general briskness of exports in metal. The total exports of pig-iron this year up to the present represent 423,074 tons, and of steel, 438,218 tons, as compared with 348,468 tons of pig-iron, and 364,699 tons of steel in the corresponding period of last year, showing an increase of 74,606 tons of pig-iron, and 73,519 tons of steel.

Wannan's Marine Engineers' Pocket Book. London: Crosby Lockwood & Co., 1898.

The author of the present volume is well known as a practical writer on topics which concern the profession of the Marine Engineer. It has already stood the test of experience. For this is the second edition enlarged, improved and revised. The work is divided into a dozen chapters whereof the first two deal concisely and clearly with arithmetical and tabular matters which should be be within the knowledge and reach of all men who handle figures, whether they be engineers or not. The remainder of the little volume is of a more restricted, if possibly even more useful, character. The rules and formulæ provided are grouped under the parts of the machinery to which they relate. Riveting, for example, comes under "boilers" and consumption under "bunkers." Matters which cannot be thus included, come under other and various heads. A large number of problems are given and are worked out so as to shew the methods to be followed in ascertaining the short way to deal with the more usual questions which the marine superintendent desires to solve. A useful index completes the book. It will very probably prove of value to those for whose benefit it is provided.

Thermodynamics of the Steam Engine. By Prof. Cecil H. Peabody. Professor of Marine Engineering and Naval Architecture, Massachusetts Inst. of Theology. Published by John Wiley & Sons, of New York, and Chapman & Hall, Limited, London.

This text-book, which is characterized by its excellence and clearness of type and printing, is in the best style of Rankine and Clerk Maxwell, but with the valuable addition that all theories are rigidly compared with experimental facts, and with examples carefully illustrated by clear views of the mechanism to which the thermodynamical theories are applied. At the same time this book, as so many others of the same type is expressed as regards its mathematical principles by such redundancy of symbols, and resulting equations are deduced almost entirely by the higher methods of pure mathematics, such as by logarithms, differential and integral calculcus that the theoretical work can only be appreciated by experts in the higher mathematics.

However, everything is so clearly and tersely expressed that the evolution of the various thermodynamic laws can be followed without difficulty, provided the reader is grounded in the mathematical principles employed. After the definitions of the various laws, and equations deduced therefrom we were much struck with the very practical analyses of the action and efficiency of various forms of heat engines commencing with injectors in Chapter IX., the simplest and yet most imperfectly known of dynamic engines. This section abounds with excellent sectional illustrations of all the best known forms of injectors with their general principles and specification fully detailed, including exhaust steam and water injectors. The velocity of the steam jet and of the entering and ejected water are all carefully formulated and analysed, so that all peculiarities of the operation may be calculated from any known conditions, and may be compared with carefully tabulated practical results. The following chapter on hot air and gas engines is also replete with interest to those desirous of appreciating the fundamental principles upon which such engines work, and the mode of testing their efficiency. The following five chapters are devoted to the steam engine in all its various forms, as compared with a theoretical heat engines, and including compound, triple and quadruple compound engines. The mode of testing such engines and the practical disturbing elements such as the influence of the cylinder walls is not forgotten, and the economy of such engines is dealt with in a long chapter replete with tabulated tests which in themselves form a reference text-book of invaluable character. This most interesting and erudite text-book closes with chapters upon compressed air and refrigerating machines, both of which are excellent examples of the application of thermodynamic laws, and we are glad to see for convenience of reference a voluminous index of subject matter is added, by which any desired subject of inquiry can be at once identified and traced by the reader without loss of time or patience.

Marine Engineers' Examination.—At the Examination held on October 11th, 12th and 13th, the following candidates passed for Extra First Class Engineers': Messrs. R. T. Rutherford, Gateshead, W. Cooper, Edinburgh and North Shields, A. F. Frame, Glasgow, and J. Paterson, Edinburgh. All passed the first time of going up, and were prepared by Mr. W. H. Thorn, 5, Waterville Terrace, North Shields.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Flying Scotsman.—On September 12th there was launched at South Shields for the Clyde Shipping Co., Glasgow, a steel steam tug of about 175 tons gross, named the *Flying Scotsman.*

Amazon.—On September 15th there was launched at North Shields for Messrs. J. & G. Alward, Limited, of Grimsby, an iron steam ketch of about 140 tons gross, named the *Amazon.*

Alabama.—On September 15th there was launched at North Shields for Messrs. J. & G. Alward, Limited, Grimsby, an iron steam ketch of about 140 tons gross, named the *Alabama.*

Crewe Hall.—On September 20th there was launched from the Jarrow Yard of Palmer's Shipbuilding and Iron Co., Limited, a large screw steamer built to the order of Messrs. Robert Alexander & Co., of Liverpool, of the following dimensions:—Length, 380 ft.; breadth, 41 ft.; depth, moulded, 30 ft. 10½ in. The vessel is constructed of steel to obtain Lloyd's highest class, and will be rigged as a two-masted fore-and-aft schooner. She is designed to load 6,750 tons deadweight on about 25 ft. draught. The engines, which are also being constructed by the Palmer's Co., are of the triple-expansion surface-condensing type, with cylinders, 24½ in., 41½ in., and 70 in., by 45-in. stroke, steam being supplied by two boilers 14 ft. 9 in. diameter by 11 ft. 9 in. long, with a working pressure of 200 lbs. As the vessel left the ways she was christened *Crewe Hall* by Mrs. Foster, wife of Captain Foster, marine superintendent for the owners.

Perth.—On September 21st there was launched at Hull for the Hull Steam Fishing and Ice Co., Limited, of Hull, an iron steam ketch of about 164 tons gross, named the *Perth.*

Rosedale and Silverdale.—On September 22nd there was launched from the yard of Earle's Shipbuilding and Engineering Co., Limited, of Hull, the steam trawlers *Rosedale* and *Silverdale,* built for the Sovereign Steam Fishing Co., Limited, of Grimsby. These are the first vessels constructed at Earl's yard for this company. Miss Leah Abraham and Miss H. M. Johnson, respectively named the ships.

Gerda.—On September 24th Mr. W. Warren launched at Beverley an iron keel, of the following dimensions, viz.:—Length, 77 ft. 6 in.; beam 14 ft. 9 in.; moulded depth, 7 ft. 6 in. She was named the *Gerda.* and was built for river traffic, to the order of Mr. T. W. Marshall, of Hull.

Noranmore.—On September 28th Messrs. W. Doxford & Sons, Limited, launched at Sunderland, the steamship *Noranmore.* She is the largest turret steamer ever built, having a deadweight capacity of 8,500 tons, and is capable of steaming ten knots per hour. The vessel has been built to the order of Messrs. Wm. Johnston & Co., Limited, Liverpool, and is classed under the British Corporation.

Universe.—On September 28th Messrs. John Priestman & Co., launched at Sunderland the steamer *Universe,* built on their patent self-trimming system, having a raised deck in the centre, from which runs a sloping deck to the sides of the vessel. The principal advantages claimed for this type of steamer are: reduction of net tonnage, saving of trimming charges, increased stability, and optional extension of water ballast under raised central deck. The *Universe* is the second vessel of this description built to the order of Messrs. Roed, M'Nair & Co., Glasgow, these gentlemen being the first to adopt the type in their steamer *Unique* launched two years ago. The dimensions of the *Universe* are:—Length, 300 ft.; width, 42 ft. 6 in.; depth, 22 ft. 4 in. Her engines, by the North-Eastern Marine Engineering Co., Wallsend, having cylinders 21 in., 36 in. and 58 in., with stroke 39 in., and boilers working at 180 lb. pressure. The vessel will have the highest class both in Lloyd's and Norwegian Veritas. The christening ceremony was performed by Mrs. Summers Hunter, of Tynemouth.

Principe.—On Wednesday, September 28th, Sir Raylton Dixon & Co., Limited, launched from their Cleveland Dockyards, Middlesbrough, a small passenger steamer built to the order of the Empreza Nacional de Navegacao à Vapor of Lisbon. Her dimensions are 116 ft. by 20 ft. 6 in. by 9 ft. 3 in., moulded, and she is intended for the company's trade on the West Coast of Africa. The dining room, smoke-room, and accommodation for first-class passengers are situated aft. They will be handsomely fitted up and provided with every convenience for the comfort of passengers in a hot climate. Triple-expansion engines will be fitted by Messrs. The North Eastern Marine Engineering Co., Limited, of Sunderland, having cylinders 10 in., 16 in., 25½ in. by 19½ in. stroke supplied with steam by a large boiler working at 180 lbs. pressure. On leaving the ways she was gracefully named *Principe.*

Britannic.—On Thursday, September 29th, Messrs. Wm. Gray & Co., Limited, launched a fine large steel screw steamer which they have built to the order of Messrs. W. H. Cockerline & Co., of Hull. She will take Lloyd's highest class and is of the following dimensions, viz.: Length over all, 336 ft.; breadth, 48 ft. 6 in.; and depth, 24 ft. The deck erections consist of a full poop, long bridge, and topgallant forecastle. The saloon and captain's and officers' rooms will be fitted on the bridge. The hull is built with deep frames, and cellular double bottom for water ballast, five steam winches, steam steering gear amidships, and screw gear aft, patent direct steam windlass, patent donkey boiler, grain divisions, stockless anchors, and a complete outfit will be fitted for a first-class cargo boat. Triple-expansion engines of first-class make are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited. They will develope over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., and extra large steel boilers having a pressure of 160 lbs. per square inch will give an ample supply of steam. The construction of the ship and machinery have been under the superintendence of Mr. G. H. Strong, M.I.N.A., of Hull, on behalf of the owners, and the ceremony of christening the steamer *Britannic* was gracefully performed by Miss Woodhead of Hull. Amongst those present at the launch were Mr. and Mrs. W. H. Cockerline and Miss Cockerline. Mr. T. D. Woodhead of W. H. Cockerline & Co., and Mrs. Woodhead.

Lemgo.—On Thursday afternoon, September 29th, the s.s *Lemgo* which has been built to the order of a Newcastle firm was launched from the shipbuilding yard of Messrs. Craig Taylor & Co., Thornaby-on-Tees. She is a handsomely modelled steel screw steamer of the following dimensions, viz., 254 ft. by 37 ft. by 18 ft., depth moulded, built to the highest class in Lloyd's, under special survey. The vessel has a long raised quarter-deck aft, bridge, and topgallant forecastle, and is constructed to carry about 2,200 tons, on a very light draught of water. She has large cubic capacity, and is equipped with four double-powered steam winches, patent direct steam windlass, patent steam steering gear amidships, screw gear aft, large donkey boiler, etc. She is rigged as a fore and aft schooner, with telescopic masts, and has all the latest improvements. Her engines have been constructed by Messrs. MacColl & Pollock, of the Wreath Quay Engine Works, Sunderland, and are of the following sizes:—18½ in. 30 in. 49 in. by 33 in., with two large boilers, 160 lbs. pressure, which will give her a speed of 10 knots loaded on a very small consumption. The vessel and her machinery have been built under the superintendence of Captain T. W. Watson, of Hartlepool, and the christening ceremony was gracefully performed by Miss Watson, the daughter of the superintendent. An interesting fact in connection with the launch was that it was not merely the birthday of the vessel, but also the anniversary of the birthday of the young lady who christened the vessel.

Orwell.—On September 29th Messrs. Laird Brothers launched at Birkenhead the torpedo-boat destroyer *Orwell,* which they have built for the British Government. She is to steam at the rate of 30 knots per hour.

Parintins.—On September 29th there was launched at Dartmouth a steel steamer of 66 gross tonnage, named the *Parintins.* She is owned in Para.

Alf.—On September 29th there was launched by Messrs Ropner & Son, at Stockton-on-Tees a steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 322 ft.; breadth, extreme, 41 ft. 6 in.; and depth, moulded, 24 ft. She has been built to the order of a Norwegian firm, and has a part awning deck, poop, and raised quarter deck. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited. The christening ceremony was performed by Mrs. Hansen, the wife of the superintending captain, who gave the steamer the name of *Alf.*

Indradevi.—On October 1st there was launched by Messrs.

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John Blumer & Co., at Sunderland, the screw steamer *Indradevi*, built to the order of Mr. T. B. Royden, Liverpool. The vessel is to take the highest class at Lloyd's, and is of the following dimensions:—Length, between perpendiculars, 328 ft.; breadth, extreme, 47 ft. 9 in.; depth, moulded, 24 ft. 1 in. The engines and boilers are being built by Messrs. John Dickinson & Sons, Sunderland, having cylinders 24 in., 40 in. and 65 in., with 42-in. stroke.

Millgate.—On October 1st the executors of T. A. Walker launched at Sudbrook the *Millgate*, another new steamer built by them for the Manchester Coasting and General Shipping Co., Limited. These boats trade between Dublin, the Isle of Man, and Manchester. The *Millgate* was towed to the Roath Dock, Cardiff, and went under the 75-ton crane to receive her boilers and heavy machinery.

Earlswood.—On October 1st Messrs. R. Craggs & Sons, launched at Middlesbrough a steel screw steamer, built to the order of Sir Christopher Furness for Messrs. Constantine, Pickering & Co., of Middlesbrough. Her dimensions are:—300 ft. between perpendiculars, 43 ft. extreme breadth, and 23 ft. depth. She is built to pass Lloyd's 100 A 1 class, under the two deck rule with one deck laid, and will be fitted with triple-expansion engines of the latest improved type, by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, of Middlesbrough, having cylinders 22½ in., 36½ in., and 61 ins. diameter, with a stroke of 42 in., steam being supplied by two extra large single-ended boilers, working at 160 lb. pressure per square inch. During construction the hull and machinery have been under the superintendence of Mr. Wm. Constantine on behalf of the owners. The vessel was named *Earlswood* by Mrs. Joseph Constantine.

Balmoral.—On October 1st Messrs. Cochrane & Cooper, Limited, launched from their Grovehill shipyard, Beverley, a new steam trawler of the following dimensions:—100 ft. by 21 ft. by 11 ft. depth of hold. The vessel, which is built to the order of the Queen Steam Fishing Co., Limited, Grimsby, will be fitted with triple-expansion engines by Messrs. C. D. Holmes & Co., Hull, and will be complete with the most modern appliances for trawling. The launching ceremony was performed by Miss Cochrane, who named the vessel *Balmoral*.

Candleshoe.—On Saturday, October 1st, Messrs. Furness, Withy & Co., Limited, launched from their Middleton shipyard, Hartlepool, a fine steel screw steamer of the following dimensions:—Length, 352 ft. by 47 ft. by 29 ft. 10 in. She has been built to the order of Messrs. Bennetts & Co., Grimsby, and is constructed throughout of Siemens-Martin steel, with a large measurement and deadweight carrying capacity of about 6,250 tons, being classed 100 A1 at Lloyd's. Six powerful steam winches, donkey boiler, patent steam steering gear amidships screw gear aft, direct steam patent windlass, stockless anchors hauling into hawse pipes, and other modern appliances are fitted for the handy working of the ship. The saloon and cabin, providing accommodation for the captain, is handsomely finished in polished hardwood. The vessel will be rigged as a two-masted fore and aft schooner, and fitted with triple-expansion engines by Messrs. Sir Christopher Furness, Westgarth & Co., Limited, Middlesbrough. The ceremony of christening the vessel *Candleshoe* was gracefully performed by Miss R. M. Withy, Brantford House, West Hartlepool.

Anglo-Chilian.—On October 3rd this large and handsomely modelled steel screw steamer, built to the order of the Nitrate Producers Steamship Co., Limited, of London, of which Messrs. Lawther, Latta & Co. are the managers, was launched from the works of Messrs. Short Brothers, Sunderland. This handsome vessel, which is constructed of steel throughout, has been built under special survey to the highest class in Lloyd's register, and is of the following dimensions:—Length, 369 ft.; breadth, 46 ft.; and depth moulded, 29 ft., with a large deadweight and carrying capacity. The erections on deck consist of full poop, long bridge amidships, and topgallant forecastle. Large and commodious deck-houses are fitted on the bridge deck for the accommodation of captain, officers, and engineers, with large and handsomely fitted saloons, the panelling being in polished hardwoods tastefully arranged. On the flying bridge deck a large and commodious teak wheel and charthouse is fitted; the steam steering gear is fitted in the engine-room, with controlling rods to wheelhouse. The crew are berthed in the forecastle, which is divided by a passageway, further divided for petty officers, &c. The double-bottom is constructed on the cellular system, sub-divided into trimming tanks. The holds are four in number, which for rapid loading and discharging have been fitted with eight powerful steam winches. The deck machinery is supplied by a large multitubular donkey boiler placed in the stokehold. In addition, the vessel is fitted with all the newest appliances for despatch and the economical handling of cargoes. A complete installation of electric light is also fitted. The vessel is to be fitted with triple-expansion engines by Messrs. George Clark, Limited, of Sunderland, having cylinders 25 in., 41 in., and 68 in. diameter, with a stroke of 48 in., and two large steel boilers 180 lbs. working pressure, fitted with Howden's system of forced draught. On leaving the ways the vessel was named *Anglo-Chilian*, the ceremony being performed by Mrs. Latta, of London, after which the company adjourned to the offices of the builders, where the usual toasts were duly honoured, and to mark the occasion, Mr. George Fleming, the chairman of the company, presented Mrs. Latta with a valuable diamond pendant.

Salfordia.—On October 3rd this vessel was successfully launched by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland. She has been built to the order of Messrs. Sivewright, Bacon & Co., of West Hartlepool and Manchester, for the Manchester and Salford Steamship Co., Limited. Her principal dimensions are:—Length, overall, 370 ft.; beam, extreme, 51 ft.; depth, moulded, 27 ft. 4 in. She is built under Lloyd's special survey for their highest class on the three-deck rules. The vessel is designed to have an exceptionally large deadweight and cubic carrying capacity on a moderate draught of water. Water ballast being an absolute necessity for vessels of this description when running unloaded, special attention has been paid to this requirement, the whole of the vessel's bottom being built on the cellular principle for the carrying of water ballast, which will also be carried in the after peak and in the shaft tunnel which has been specially constructed for this requirement. She is divided transversely by six watertight bulkheads, also with longitudinal bulkheads, which are also fitted in the bridge. A large poop is fitted at the after-end of the vessel capable of carrying cargo, which can also be carried in the bridge. The whole of the accommodation for saloon, captain, officers and engineers' messrooms, &c., being in houses on top of the bridge; the crew and firemen being berthed in a commodious topgallant forecastle. The steam-steering gear is placed at the after-end of the engine casings, being connected by controlling gear to the fore end of the bridge; a powerful screw gear being fitted on the poop deck aft. The vessel is fitted with four masts, each being fitted with double derricks for the rapid handling of cargo. There are, in all, seven powerful steam winches for the working of cargo, these being supplied with steam from the main boilers. A patent steam windlass is fitted on the forecastle deck, and every consideration has been given to the arrangement of the deck machinery. All these deck engines will exhaust into a large winch condenser placed in the engine-room. In addition to the derricks attached to the masts there are two combined steel derricks and ventilating posts, fitted for the working of the reserve bunker hatch. Three of the masts are fitted with sails, and a bowsprit is fitted in connection with the clipper stem, the stem being ornamented at the outer end by some graceful carved work. Beams are placed across the vessel between the main cargo hatches, supported by the necessary stanchions, &c., these being suitable for the laying of a shelter deck in case of cattle being carried. The vessel is built on the deep frame system, the frames being of Z section which are carried to the top of the erections on deck. There are five large cargo hatchways, also a good arrangement of hatches in connection with the bunkers of the vessel. Four boats are fitted on top of the accommodation amidships. The vessel is also provided with patent stockless anchors and a liberal outfit of compasses and other instruments for the safety of the vessel. The propelling machinery has been constructed by Messrs. Geo. Clark, Limited, of the Southwick Engine Works, Sunderland, the sizes of the cylinders being 24½ in., 40 in., 67 in. by 45 in. stroke, supplied with steam by three large boilers working at 180 lbs. pressure. The arranging and building of the vessel has been under the personal superintendence of Capt. Bacon, who has been assisted by Mr. James Robinson, M.I.N.A., of Manchester, superintendent to the company. A large company witnessed the launch, which was most successful in every way, the model of the vessel being very much admired. The vessel was gracefully christened and launched by hydraulic power by Miss Gladys Bacon, daughter of Capt. Bacon. There were also present at the launch Capt. W. C. Bacon; Capt. Crisp, who will take command; Capt. Adam Marshall, of Sunderland; Mr. and Mrs. C. H. Greenwell, of Sunderland; Mr. James Robinson, of Manchester; Master Harvey Bacon, Mrs. Phorson, and Messrs. Robert Thompson, J.P., C. E. Thompson, J.P., James Marr, and P. Phorson of the builder's firm. After the launch, the company adjourned to the builders' luncheon room, where the usual toasts were duly honoured, Miss Gladys Bacon being presented by the builders with a diamond brooch, as a memento of the launch.

Ivy.—On October 4th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel lighter of the following dimensions:—Length, overall, 71 ft.; beam, moulded, 19 ft. 8 in.; depth, amidship, 8 ft. 6in., and with a carrying capacity of 250 tons. The vessel was built to the order of Mr. John Scott, High Street, Hull, and is the seventh built for him. As she left the ways she was christened *Ivy* by Miss Alice Dunn.

Clan Ferguson.—On October 4th Messrs. Vickers, Sons, & Maxim launched at Barrow for Messrs. Cayzer, Irvine & Co., the turret-deck steamer *Clan Ferguson*. She is 400 ft. long, and has a deadweight cargo-carrying capacity of about 7,000 tons.

Narberth Castle.—On October 10th there was launched at Hull for Hull owners, an iron steam ketch of 168 gross tonnage named the *Narberth Castle.*

Dawlish.—On Saturday, October 15th., Messrs. Richardson, Duck & Co., launched from their yard, a steel screw steamer of the following dimensions, viz.:—Length over all, 351 ft.; breadth extreme, 46 ft.; depth moulded, 27 ft. 3 in.; deadweight carrying about 5,800 tons. This vessel which has been built to the order of Messrs. Anning Bros. of Cardiff, will class 100 A1 on Lloyd's Register, and has been built under special survey. She is of the 3-deck type, one deck laid with poop, long bridge, and top-gallant forecastle. Accommodation for captain and passengers is provided in poop, officers, and engineers being berthed in iron houses, on bridge deck, and crew in top-gallant forecastle. A cellular double bottom and fore-and-aft peak tanks are fitted for water ballast, and equipment includes 5 steam winches, large horizontal donkey boiler, steam windlass, stockless anchors, steam steering gear, etc. The engines by Messrs. Blair & Co., have cylinders 24 in., 40 in., and 66 in., by 45 in. stroke, steam being supplied by two single-ended boilers, having a working pressure of 160 lbs. As the vessel left the ways, she was christened *Dawlish* by Mrs. Richard Anning of Cardiff.

Luddick.—On Monday, Oct. 17th, there was launched from the yard of Messrs. R. Williamson & Son, Workington, a finely modelled screw steamer built to the highest class at Lloyds, for Messrs. the Aberdeen, Newcastle, and Hull Steam Co. Limited, of Aberdeen. Her dimensions are:—Length between perpendiculars 166 ft.; breadth, 26 ft.; depth moulded, 12 ft. 10½ in., and designed to carry 680 tons on Lloyd's freeboard. The engines are to be supplied by Messrs. Ross & Duncan, of Govan, and are of the compound type, having 2 cylinders 21 in. and 42 in., with a stroke of 30 ins. As she left the ways she was gracefully named *Luddick* by Miss Skirving, daughter of the manager to the Company.

Windermere.—On October 18th Mr. Henry Scarr launched at Hessle yard, an iron keel, built to the order of Mr. W. Ford, shipowner, Hull. The dimensions are—Length over all, 62 ft., beam, 16 ft.; depth, 8 ft.; tonnage, 135 tons. The vessel was named the *Windermere* by Mrs. Ford, wife of the owner. The *Windermere* is a sister ship to the *Citizen* and *Albion*, recently launched by Mr. Scarr for the same owner.

Politician.—On Wednesday, Oct. 19th there was launched from the East Shipbuilding yard of C. S. Swan & Hunter, Limited, a large steel screw steamer which has been built to the order of Messrs. Thos. & Jas. Harrison of Liverpool, for their well-known regular line from Liverpool to Calcutta. The principal dimensions of the vessel are:—Length overall 485 ft., breadth 56 ft. 3 in., and depth moulded 34 ft. 10 ins., and she is expected to carry a deadweight cargo of 10,400 tons on a draught of water of 26 ft. 6 ins. She has a long poop, wherein is accommodation for the crew, a long bridge for cargo and a topgallant forecastle. The accommodation for captain officers, and engineers, is provided in deck houses on the top of the bridge deck. The machinery has been constructed by the Wallsend Slipway & Engineering Co. Limited, and consists of a set of triple-expansion engines having cylinders 28in., 46 in., and 75 in. in diameter, with a stroke of 60 in. working at a pressure of 180 lbs. per sq. in. On leaving the ways the vessel was named the *Politician*, by Miss Crowe of Leeds.

Ran.—On Wednesday, October 19th, Messrs. Wm. Gray & Co., Limited, launched a large steel screw steamer for Mr. Jacob R. Olsen, of Bergen, Norway. She is built to Lloyd's 100 A1 class, and her dimensions are:—Length, overall, 336 ft.; breadth, 47 ft., and depth 24 ft. 10 in. The deck erections consist of a full poop, long bridge, and topgallant forecastle. The saloon and captain's and officers' rooms will be fitted under the poop. The hull is built with web-frames and cellular double-bottom for water ballast. Five steam winches, steam-steering gear amidships, and screw gear aft, patent direct steam windlass, two donkey boilers, grain divisions, stockless anchors, and a complete outfit will be fitted for a first-class cargo boat. Triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited. They will develop over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., with large steel boilers constructed for a working pressure of 160 lbs. per square inch. The ceremony of christening the steamer *Ran* was gracefully performed by Mrs. Hansen, wife of Captain E. Hansen, of Bergen, Norway.

Romney.—On October 19th Messrs. Sir Raylton Dixon & Co., Limited, launched from their Cleveland dockyards at Middlesbrough, for Liverpool owners, the s.s *Romney* of 4,600 tons deadweight capacity and arranged for the cattle trade.

Nelson.—On October 19th there was launched from the yard of Messrs. Wm. Doxford & Sons, Limited, at Pallion, Sunderland, the turret-deck steamer *Nelson*, built to the order of Messrs. A. W. Pickard & Co., of London. The vessel has been built under the British Corporation, and will receive their highest class.

Annon.—On October 20th Messrs. Cochrane and Cooper Limited, launched at Beverley a steam trawler built to the order of Mr. W. Grant, of Grimsby. The vessel is 100 ft. by 21 ft., and with 11 ft. depth of hold, and will be fitted with triple-expansion engines by Messrs. C. D. Holmes & Co., of Hull. The trawler was named the *Annon*.

H.M.S. Prometheus.—On October 20th there was launched by Earle's Shipbuilding Company at Hull, the *Prometheus*, a third-class cruiser, built for the British Navy. The vessel, which was christened by Lady Maclure, wife of Sir J. W. Maclure M.P., deputy chairman of Earle's Company, is a sister ship to the *Perseus*, launched by the same company in July, 1897. A special feature of the launch was that the *Prometheus* had on board her engines and boilers, and altogether she is in such a forward condition that with but little delay she may be ready for her commission, practically all that is required being her armament.

Anson.—On October 20th Messrs. Cochrane & Cooper, Limited, launched from their Grovehill Shipyard, Beverley, a new steam trawler of the following dimensions:—100 ft. by 21 ft. by 11 ft. depth of hold. Engines of triple-expansion type of 45 H.P., will be supplied by Messrs. C. D. Holmes & Co., Hull. The vessel which was built to the order of Mr. W. Grant, Grimsby, will be complete with the most modern appliances for deep sea trawling. Miss Daisy Croft named the trawler *Anson*, and after the ceremony the company adjourned to the Beverley Arms for breakfast.

LAUNCHES.—Scotch.

May.—On September 28th there was launched from the shipbuilding yard of Messrs. John Scott & Co., Kinghorn, a steel screw steamer for passenger and cargo traffic to the Mediterranean, built to the order of Messrs. Bailey & Leetham, Hull. The vessel has been built to Lloyd's highest class for well-decked steamers, having large, strong, portable hatch fitted over well, and is provided with deep ballast tank amidships and trimming tank in after peak. Her dimensions are:—Length, between perpendiculars, 237 ft.; breadth, moulded, 34 ft.; depth, moulded, 17 ft. 9 in.; gross tonnage, 1,415 tons; registered tonnage, 814 tons. She is fitted with triple-expansion engines, and her speed is designed to be about 10½ knots per hour.

Tagus.—On September 28th the Caledon Shipbuilding and Engineering Co., Limited, launched from their yard at Dundee a steamer which they have built to the order of Messrs. Frederick Leyland & Co., of Liverpool. The vessel is 230 ft. long, 28 ft. 6 in. broad; and 18 ft. 6 in. deep, and has a gross tonnage of 900. She is intended for the passenger and cargo trade between Liverpool and Portugal, and has been built in excess of Lloyd's highest class. The engines are of the compound type, the cylinders being of 18 in. and 48 in. diameter, with a 36-in. stroke. The steamer was named *Tagus* by Miss S. M. Fleming, of Halifax.

Sir Henry Alderson.—On September 29th Messrs. Hawthorns & Co., Limited, Leith, launched the steamer *Sir Henry Alderson*, built to the order of Her Majesty's Secretary of State for War. The vessel will be fitted by the builders with triple-expansion engines, and is intended for service at Chatham.

Needles.—On September 29th the London and Glasgow Engineering and Iron Shipbuilding Co., Limited, launched from their yard at Govan the first of two large screw steamers they are building for the Eastern trade of the Clyde Shipping Co. This is the third vessel of the type which the concern has built for the company. The dimensions are:—416 ft. long over all, 49 ft. broad, and 31 ft. deep (moulded), which represent a considerable advance on the existing steamers of the Clyde Co. The new ships are designed to carry from 7,000 to 7,500 tons deadweight, and their gross tonnage is about 4,750 tons. The hold capacity is between 9,000 and 10,000 tons at 40 cubic ft. per ton, and in addition to this there is bunker capacity of about 600 tons. The vessel has been built to the highest class in the British Corporation, and is much in excess of the rules. Special attention has been given to the cargo spaces, and instead of the usual three rows of pillars fore-and-aft there is only one, which takes the shifting-boards, the absence of quarter pillars being compensated for by the girders under the beams, and special pillars at the ends of the hatches. This is anticipated to be of great advantage when loading and discharging large cargoes such as long timber, bars, &c. A double bottom for water-ballast extends all fore-and-aft, and, in addition, there is a deep tank abaft the engine-room; the combined capacity will be about 1,600 tons, and will enable the vessel to cross the Atlantic without the aid of other ballast. All the most modern appliances for handling cargo have been introduced, including nine large specially designed steam winches, powerful steam-steering gear, and a steam windlass and capstan. There is a complete electric installation, both for working the cargo and lighting the ship. The captain, officers', and engineers' accommodation is on the bridge deck. The engines, which are supplied by the builders, are triple-expansion. The diameters of the cylinders are 27 in., 42 in. and 69 in., by 4 ft. 6 in. stroke; and the fittings embrace all the latest improvements. There are two single-ended boilers, 15 ft. 9 in. mean diameter by 12 ft. 6 in. long, arranged to work with forced draught. The working pressure is 160 lb. per square inch. In addition, there is an auxiliary boiler for supplying steam to the winches and electric-light engines. As the vessel left the ways she was named the *Needles* by Mrs. William Cuthbert, of Glasgow.

Sobo.—On September 29th there was launched from the Clydeholm shipbuilding yard of Messrs. Barclay, Curle & Co., Limited, a high-class and beautifully-modelled steel screw-steamship, to the order of the African Steamship Co., for their Liverpool and West African trade. The vessel is classed to Lloyd's 100 A1 spar-deck rule, is about 3,800 tons gross, her dimensions being:—Length, 357 ft.; breadth, 44 ft.; and depth, 25 ft. 3 in. She has been specially designed for the West African passenger and cargo trades, her carrying capacity being exceptionally large on a small draft, so that she may be able to touch at ports usually inaccessible to other steamers. On deck she is fitted throughout with all the most recent and up-to-date appliances for safe and rapid loading and discharging of the special cargoes in the trade of the West Coast. All the deck gear, such as winches, cranes, and windlass, have been manufactured to owners' requirements; while the steam steering-gear is by Messrs. Harrison, and the hand-gear by Hastie, of Greenock. The vessel is being fitted out for 70 first-class and 40 second-class passengers, while the between decks have been designed with the view of carrying troops whenever necessary at the shortest notice. In appearance the vessel, with her combined long poop, bridge, and forecastle, the midship and aft promenade decks, and her navigating bridge above all, gives one more the idea of a Cape liner rather than a steamer to the recently-developed West Coast; but such is the foresight of the company, that in placing the contracts for this vessel and the others building by the same firm they had in view the ultimate great development of Africa and the consequent augmentation of trade, both in passenger and goods traffic. The *Sobo* and her sister ship now building will be ahead of anything at present in the trade, both as regards speed and the comfort of passengers, and in all the smallest details it is evident that both builders and owners have resolved to turn out special steamers to suit the rapidly-increasing requirements. The accommodation for the saloon passengers is placed amidships under and on top of the bridge deck; the cabins are all exceptionally roomy and lofty, specially well ventilated, and each having large open square port-lights and jalousied shutters. The saloon is very chastely wrought out, being lined with solid marble panels which, in addition to a beautiful appearance, gives the eye a delicious sense of coolness very pleasing and restful to the voyager in the African glare. Over the bridge deck is the first-class passengers' promenade deck of teak, stretching from end to end and side to side of bridge, and on which are placed the handsome teak-house, containing the smoke-room, the dining-saloon, cupola skylight, and the navigating bridge overhead. The second-class passengers are situated aft in the poop, and they also have an extended promenade deck overhead, including smoke-room, &c. The vessel is lighted throughout by electric light installation by Messrs. Siemens Bros., and the dining-saloon is fitted with a number of small table d'hote dining-tables, with electric clusters pendant from the roof overhead. One of the hold compartments is being fitted out as a cold chamber, with refrigerating machinery by Messrs. Hall, and with separate divisions for milk, fruit, meat, vegetables, &c., of ample capacity to ensure these being fresh during the entire round voyage. The machinery and boilers are being constructed by the builders at the Finnieston Works, and are of the triple-expansion type. On leaving the ways the vessel was gracefully named the *Sobo* by Mrs. Alder, wife of Mr. W. G. B. Alder, and was afterwards towed to the harbour to receive her machinery. The company adjourned after the launch to the model room, where luncheon was served and the usual toasts given and responded to.

Steam Hopper Barge.—On September 29th Messrs. William Simons & Co., Limited, Renfrew, launched complete the first of two powerful steam hopper barges which they have constructed for the Thames Conservancy, under the direction of the well-known Naval architect, Mr. George Eldridge, formerly of the Clyde, now of London. The dimensions are as follows:—Length, 1 0 ft.; breadth, 30 ft.; depth, 15 ft. 3 in., having a hopper capacity to carry about 1,000 tons of dredgings. The vessel is propelled by one set of triple-expansion engines and two return tubular boilers of about 1,200 I.H.P., working pressure 160 lbs. Special appliances are provided to work the hopper doors by steam power from independent engines, placed at forward end of the hopper, also steam windlass forward and capstan aft. Cabins are fitted at after-end of the vessel for the officers, the crew being located forward. The vessel was launched complete with steam up ready for work, and left for London a few days after.

Antillian.—On September 30th Messrs. Caird & Co., shipbuilders, Greenock, launched the steel screw steamer *Antillian* for the West India and Pacific Steamship Co. The vessel is of 5,700 tons gross, and is 420 ft. in length, 49 ft. in breadth, and 33 ft. 6 in. in depth. The builders will furnish the steamer with triple-expansion engines of 3,500 I.H.P.

Prince and Tug.—On September 30th the Dundee Shipbuilders' Co. launched from their Panmure Yard two tugs which they have built for London owners. The vessels, which are intended for towing purposes on the Thames, are each fully 70 ft. in length. One is named the *Prince*, but the other has not yet been christened. The tugs are to be engined by Messrs. Whyte & Mair.

Moravian.—On September 30th Messrs. Robert Napier & Sons launched at Govan the *Moravian*, a screw steamer of about 4,700 tons gross, which has been built for Messrs. George Thompson & Co.'s service between London and Australia. The *Moravian* is the fifth vessel Messrs. Napier have built for the line, and in design and arrangement she naturally marks an advance on her predecessors. Everything that could be done to promote the comfort of passengers and the easy carrying of cargo has been done. There is a complete installation of electric light, and refrigerating plant is provided for the transport of frozen meat, &c. The vessel is 380 ft. long, 47 ft broad, and 32 ft. deep, with a full poop, long bridge, and topgallant forecastle. Although intended to carry a large cargo, the vessel will have a sea-going speed of 13 knots. Hull and machinery have been constructed under special survey to Lloyd's highest class, and in accordance with the Board of Trade requirements. The most modern appliances for the efficient and economical working of the ship have been provided. The engines are of the triple-expansion type, and of 3,700 I.H.P. Steam will be supplied by two double-ended boilers with a working pressure of 200 lbs. Howden's forced draught will be used. The launch took place shortly before one o'clock, Mrs. Stephen Thompson releasing the ship, and Miss Emily Henderson performing the naming ceremony.

Earl, Editor and Egret.—On September 30th Messrs. Mackie & Thomson launched at Govan three screw fleeters of 160 tons, built for the Great Northern Steamship Fishing Co., Limited, Hull. The vessels are the first to be launched of fifteen the firm is building to the order of Messrs. Muir & Houston, Kinning Park. They were named, *Earl*, by Mrs. R. H. B. Thomson, Glasgow; *Editor*, by Miss Vina Younger, County Durham; and *Egret*, by Miss Mattie Houston, Glasgow.

Hakuai Maru.—On October 1st Messrs. Lobnitz & Co., Limited, launched at Renfrew the steel-screw steamer *Hakuai Maru* for the Red Cross Society of Japan. The vessel is 2,550 tons gross, and will be furnished by the builders with triple-expansion engines of 3,000 I.H.P.

Cargo Vessel.—On October 1st Messrs. John Duthie & Co., shipbuilders, Montrose, launched their first vessel from the yard, which was formerly occupied by the now defunct Montrose Shipbuilding and Engineering Co., Limited. The steamer was left in frame by the latter company and was completed by the new lessees of the yard for the original order for Mr. Joseph Constant, London. The vessel is about 500 tons, intended for the general cargo trade, is 130 ft. long, between perpendiculars, has a beam of 25 ft., and a moulded depth of 14 ft. She was not named.

Baron Fairlie.—On October 1st Messrs. A. Rodger & Co., Port-Glasgow, launched a large steel screw steamer of 6,000 tons deadweight for Mr. Hugh Hogarth, Glasgow and Ardrossan, being the seventh vessel Messrs. A. Rodger & Co. have built for Mr. Hogarth. The dimensions are :—Length, 354 ft.; breadth, 45 ft.; depth, 28 ft. 6 in. This steamer is built to the highest British Corporation class. Messrs. Dunsmuir & Jackson, Govan, will supply triple-expansion engines, the cylinders being 25 in., 42 in., and 68 in. by 45 in. stroke. The steamer was gracefully named *Baron Fairlie*, by Lady Alice Boyle, who was accompanied by her parents, Lord and Lady Glasgow. Immediately after the launch, which was very successful, the steamer was towed to Govan to receive her machinery.

Balmarino.—On October 1st the Ailsa Shipbuilding Co., Troon, launched from their yard a steel screw steamer for Mr. John Kelly, of Belfast. The vessel has been built under special survey to the highest class at Lloyd's and under the superintendence of Mr. Joseph Lewis, consulting engineer, of Belfast. Dimensions are :—Length, over all, 170 ft.; length, between perpendiculars, 162 ft.; breadth, moulded, 25 ft.; depth, moulded, 12 ft. 6 in.; designed to carry about 500 tons. The engines will be compound surface condensing of large power to ensure a high speed at sea. The vessel has all modern appliances for the quick loading and discharging of cargo and safe navigation. As she left the ways she was gracefully named *Balmarino*, by Mrs. Kelly, wife of the owner.

Arcturus.—On October 1st Messrs. Gourlay Bros. & Co., launched at Dundee the third of four new steamers for the Finska Steamship Co., Dundee. The vessel is a steel screw steamer, with accommodation for 275 passengers in all, and is to be used for the Co.'s passenger and cargo traffic between Hull and Helsingfors, Finland, being specially constructed with a view to navigation through ice. The dimensions of the *Arcturus* are :—Length, 280 ft.; breadth, 38 ft.; depth, 23 ft. 3 in.; and gross tonnage, about 2,050 tons.

Induna.—On October 4th, at Linthouse, Messrs. Alex. Stephen & Sons launched a steel screw steamer, the sixteenth built by them to the order of Messrs. Maclay & McIntyre, Glasgow, and the vessel was named *Induna* by Mrs. McConnell, The Rand, Bedale, Yorkshire. The *Induna's* dimensions are—380 ft. by 50 ft by 28¼ ft., with engines 25 in., 41 in. and 67 in. diameter by 48 in. stroke, and two boilers working at 175 lbs. pressure with Howden's forced draught, and her deadweight carrying capacity is about 7,100 tons. She is built to the highest class in Lloyd's, and in her design and equipment embodies all that experience has found to be best for actual service.

Pelican.—On October 4th there was launched as Paisley a steel steam tug of 200 gross tonnage, named the *Pelican*. She is owned in Freemantle.

Frontier Town.—On October 4th there was launched at Paisley a steel, schooner-rigged steamer, of 300 gross tonnage, named the *Frontier Town*. She is owned in Newry.

Princess May.—On October 11th Messrs. A. & J. Inglis, Pointhouse, launched a paddle-wheel steamer, named *Princess May*, for the Dumbarton and Balloch Joint Line Committee for passenger service on Loch Lomond. The vessel is a finely-modelled light-draught steamer, with spacious saloons before and abaft machinery space on main deck, the saloon deck overhead affording a splendid promenade for passengers.

Sifka.—On October 13th Messrs. Ramage & Ferguson, Limited, launched from their yard a screw steamer of about 1,150 tons gross, built to the order of Messrs. J. T. Salvesen & Co., Grangemouth, for their general trade. The dimensions of this steamer are—224 ft. by 33 ft. by 17 ft. 3 in. moulded, with triple-expansion engines having cylinders 17 in., 27 in., 44 in. diameter by 30 in. stroke, steam being supplied from a large multitubular boiler, working up to 160 lbs. pressure. All the details about this ship are of the most modern and improved description for working the vessel and cargo in the most efficient manner, and include steam-steering gear, steam windlass and capstan, steam winches, &c. This is the fourth steamer built by the same builders for Messrs. Salvesen during the last few years, the others being the *Vala*, *Vina* and *Vestra*. On leaving the ways the vessel was named *Sifka* by Miss Cecil Salvesen, Lathallan, Polmont, daughter of the managing owner. The builders afterwards entertained a large party to lunch, when the toasts usual on such occasions were duly honoured.

Steam Hopper Barge.—On October 14th Messrs. Wm. Simons & Co., Limited, launched the second of two powerful steam hopper barges which they have constructed for the Thames Conservancy, under the direction of Mr. George Eldridge, N.A., of London. The dimensions are as follows :—Length, 190 ft.; breadth, 30 ft.; depth, 15 ft. 3 in., and the barge has a hopper capacity to carry about 1,000 tons of dredgings. The vessel is propelled by one set of triple-expansion engines and two return tubular boilers of about 1,200 I.H.P.; working pressure 160 lbs. Special appliances are provided to work the hopper doors by steam power from independent engines, placed at forward end of the hopper, also steam windlass forward and capstan aft. Cabins are fitted at after end of the vessel for the officers. The crew is located forward. The vessel was launched complete with steam up ready for work and left for London a few days after.

Raphael.—On Saturday, October 15th, Messrs. David & Wm. Henderson & Co., of Partick, launched the first of three steamers being built for Messrs. Lamport & Holt's South American Line, and specially constructed to carry live stock As she left the slip, she was christened the *Raphael*, the ceremony being gracefully performed by Miss Doughty, daughter of Alexander Doughty, Esq., of Rangoon, Perthshire and Liverpool. The *Raphael* is 380 ft. long, 50 ft. broad, and 30 ft. 6 in. deep; has been constructed under special survey in British Corporation; is in every respect supplied with the latest improvements, and well calculated to add to the prestige of the line under whose flag she will sail.

Fifeshire.—On October 15th the Clydebank Engineering and Shipbuilding Co. launched a fine steel cargo steamer named the *Fifeshire*, built to the order of Messrs. Turnbull, Martin & Co., of London. The new vessel is 420 ft. long, 54 ft. 6 in. broad, and 32 ft. moulded depth, and is of about 5,800 tons gross. She is fitted with a complete shelter deck, having large openings in the way of hatches, and has a promenade deck amidships. The *Fifeshire* is intended for trade between the Antipodes and this country, and the foreholds are insulated and fitted up for the special purpose of carrying frozen mutton. A large installation of refrigerating machinery of the Linde type is fitted. The ship is lighted throughout by electricity. The *Fifeshire* has been built under Lloyd's special survey, and will be completely equipped to comply with the Board of Trade requirements for a passenger certificate. The ship is propelled by a single screw, actuated by triple-expansion engines. The steam pressure is 160 lbs. per square inch, and the boilers are fitted with Howden's arrangement for forced draught.

Atherine.—On October 15th a steam trawler, built to the order of Messrs. Robert Hastie & Sons, North Shields, was launched by Messrs. Hall & Co., Aberdeen. The vessel, which was named the *Atherine*, is 102 ft. in length, 20 ft. in breadth, and 11 ft. in depth. She has a gross tonnage of 150, and will be fitted up with triple-expansion engines of 350 I.H.P.

Ierne.—On October 15th Messrs. Blackwood & Gordon, Port-Glasgow, launched the twin-screw steamer *Ierne* for the Commissioners of the Irish Lights, Dublin, of the following dimensions :—126 ft. by 23 ft. by 12 ft., and about 200 tons gross. The steamer is specially fitted for carrying heavy stone for building the new Fastnet Lighthouse, and lighthouse work generally, with very heavy winch and windlass. The steamer will be propelled by two sets of compound surface-condensing engines, having cylinders 13 in. by 30 in. diameter by 21 in. stroke, supplied with steam from one large multitubular boiler working at 150 lbs. yer square inch. The launching ceremony was performed by Miss Agnes C. Macalpine, daughter of the engineering partner of the firm.

Atlankico.—Lately Messrs. Russell & Co. launched at Port-Glasgow the steel screw steamer *Atlankico*, of 5,400 tons deadweight carrying capacity, for Austrian owners. Triple-expansion engines will be supplied by Messrs. Kincaid & Co., Greenock.

Prince George.—On October 17th Messrs. A. & J. Inglis launched from their shipyard at Pointhouse, Glasgow, a paddle-wheel steamer for the Dumbarton and Balloch Joint Line Committee for passenger service on Loch Lomond. The steamer is a duplicate of the *Princess May*, launched on October 11th, by the same builders for the Loch Lomond service. The joint proprietary, recognizing the popularity of Loch Lomond as a tourist and excursion resort, have set themselves to meet in a most efficient manner the requirements of the traffic, and are thus prepared for prospective further development with, in addition to the present fleet of steamers, these two new comfortable and commodious passenger steamers, which are well calculated to commend themselves to the increasing exactions of the travelling public. As the vessel left the ways she was named *Prince George* by Miss Thompson, of Devonshire Gardens, Glasgow. After the launch the company adjourned to the model-room and were entertained by the builders.

Maplemore.—On October 17th Messrs. Charles Connell & Co. launched from their shipbuilding yard at Whiteinch, the s.s. *Maplemore*, a sister ship of the *Pinemore* launched by them in June last for Messrs. William Johnston & Co., Limited, Liverpool.

Elector, Elk and Elm.—On October 17th Messrs. Mackie & Thomson, shipbuilders, Govan, launched the *Elector*, the *Elk*, and the *Elm*, three steel screw fleeters, which they have built to the order of Messrs. Muir & Houston, Kinning Park, for the Great Northern Steamship Fishing Co., Hull. The dimensions of each are :—Length, 103 ft. 9 in. ; breadth, 21 ft. ; depth, 11 ft. 7 in. ; tonnage, 160 tons gross. Triple-expansion engines will be supplied by Messrs. Muir & Houston. The vessels which were named by Mrs. J. P. Laidlaw, Miss Houston, and Mrs. Donald, are the second three of an order of fifteen which the firm have in hand for the same owners.

Ulundi.—On October 17th Messrs. Hawthorns & Co., Limited, launched at Leith a powerful screw steam tug, built to the order of Messrs. Messina Brothers, Port-Elizabeth. This vessel will be fitted with all the most modern appliances for a vessel of her type. As she left the ways she was named *Ulundi* by Miss Young, daughter of the owners' superintendent.

Don and Esk.—On October 18th the Irvine Shipbuilding and Engineering Co., Limited, Irvine, launched two screw steam trawlers. The vessels are built of steel, to Lloyd's highest class, under special survey, and are fitted with the most modern appliances for their work in the North Sea. They are of the following dimensions :—105 ft. by 21 ft. by 11 ft. 6 in. moulded, and are being supplied by Messrs. Muir & Houston, Limited, Glasgow, with triple-expansion engines of about 250 I.H.P., having cylinders 10 in., 16 in. and 27 in., by 20 in. stroke, steam being supplied by a large steel boiler working at 180 lbs. pressure. The vessels were named *Don*, by Mrs. James Wilson, Ayr; and *Esk*, by Mrs. William Mackie, Glasgow.

Virgo.—On October 18th the Grangemouth Dockyard Co. launched from their yard at Grangemouth the first of the ice-breaking steamers built to the order of the Finska Steamship Co., of Helsingfors, Finland. These vessels present several points of interest incidental to their intended service in ice-bound waters. The stems have been specially designed and strengthened for breaking up great thicknesses of ice. The stern of the "gunboat" pattern, overhanging and protecting the rudder is provided with a cast steel cutting edge, where it enters the water, and the rudder is a steel casting of great strength, and weighing several tons. These castings have been manufactured by the Steel Co. of Scotland, and they are so designed as to enable the vessel to break up thick fields of ice as readily going astern as going ahead. The propeller, being subject to severe concussions with the floating blocks, is of nickel steel, the toughest and most tenacious alloy known. Internally the vessels have been strengthened to resist the heavy shocks met with in ramming the ice, and their scantlings, particularly at the fore and aft ends, are enormously in excess of those required for an ordinary vessel of this size. In the machinery department are introduced a number of special arrangements suggested by the experience of the company, such as devices for the prevention of freezing in the intense cold of the regions where these vessels will ply, and strengthening the requisite parts to resist the shocks met with by the propeller. The vessels will be classed 100 A1 at Lloyd's under special survey, and their dimensions are :—180 ft. by 28 ft. by 21 ft. to the awning deck. Accommodation is provided on the main deck for officers, engineers, and crew. On the awning deck is fitted a large deck-house for a number of first-class passengers, tastefully fitted up. A powerful search light will be fitted, and a complete installation of electric light. The vessels will be heated throughout by a special system of steam-heating pipes, and be fitted with steam steering gear, quick-warping steam windlass, and three powerful steam winches fitted in conjunction with Tait's patent derricks. Triple-expansion engines of large power, with two marine-type boilers, working at 160 lbs. pressure, will be provided by Messrs. Cooper & Greig, Dundee. As she left the ways she was named *Virgo* by Mrs. Harvey, wife of one of the partners.

Craigneuk.—On October 19th Messrs. A. Rodgers & Co. launched at Port-Glasgow the steel screw steamer *Craigneuk* of 2,560 tons gross register, capable of carrying 4,300 tons deadweight. The owners are Messrs. Russell, Huskie & Co., Leith, and the vessel measures :—Length, 314 ft. ; breadth, 44 ft. ; depth, 23 ft. 3 in. moulded. The machinery will be supplied by Messrs. Hall Brown, Buttery & Co., Glasgow.

Sappho.—On October 19th the Caledon Shipbuilding and Engineering Co., Limited, launched from their yard at Dundee, the last of four passenger and cargo steamers which they have on order for Messrs. Thomas Wilson, Sons & Co., Limited, Hull. The vessel has been built to the highest class of the British Corporation special survey and to the Board of Trade requirements, and is of the following dimensions :—Length, over all, 269 ft. ; breadth, 33 ft. 8 in. ; depth, moulded, 18 ft. 1½ in. ; with a gross tonnage of about 1,500. The engines are of the triple-expansion type, having cylinders 18 in., 32 in., and 56 in., with a piston stroke of 36 in. Two large steel boilers, provided with forced draught, supply steam at a pressure of 210 lbs. per square inch. The steamer was christened *Sappho* by Mrs. G. W. Muir, wife of Captain Muir, of the Leyland Line, Liverpool.

LAUNCH—Irish.

Castilian.—On October 19th there was launched from the south yard of Messrs. Workman, Clark & Co.'s Shipbuilding Works, a large steel screw steamer built to the order of the Allan Line Steamship Co., Limited, Glasgow, for their trade between Glasgow, Liverpool, and the principal Canadian ports, and she has been specially designed to meet the modern requirements of a large first-class passenger, cattle and cargo vessel, engaged in the Atlantic trade. The *Castilian* is of the following dimensions:—Length, 470 ft.; breadth, 53 ft. 9 in.; depth, moulded, 36 ft.; and gross tonnage of over 7,000. She has been built under the special survey of the British Corporation of Shipping, Glasgow, and takes their British Standard class, and in conformity with the Allan Line custom a considerable amount of extra strengthening above Classification Society's requirements is introduced. The bottom of the vessel is framed on the cellular system, which allows of carrying a large quantity of water ballast in the double bottom as well as adding to a very large extent to the safety of the ship. One of the cargo holds is also sub-divided, forming a deep ballast tank which gives nine watertight compartments, which is above the ordinary requirements, as well as having partition bulkheads for the division of cargo and coal bunker spaces. There are three complete steel decks extending fore-and-aft and above the upper one a permanent shelter deck from stem to stern with a bridge deck above. As the amount of cargo that the *Castilian* can carry is about 8,400 tons every preparation has been made for handling expeditiously this large weight which can be worked simultaneously from each of the six hatchways as well as through gangway doors. Ten derricks with powerful steam winches are provided for this purpose several of the derricks being suspended from crane posts. The holds have been arranged to give a minimum of broken stowage space and hold pillars have to a large extent been dispensed with and girders substituted. As this vessel will be largely engaged in the passenger trade a large portion of the vessel is devoted to their accommodation. The first-class are placed in the bridge-house amidships, and this is entirely fitted up for their use. Access to this portion of the vessel can be made either from the aft end of the bridge or by two companion houses, one of which is handsomely fitted up as a music-room and from this a handsome stairway leads to the dining-saloon which extends across the vessel and where there is seating room for 100 passengers. This apartment is handsomely panelled in various shades of hardwood and upholstered in velvet, and the arm chairs and other furniture of oak to match the panelling. A commodious smoke-room is situated at the other end of the bridge house and is amply supplied with sofas, tables and everything to make it into comfortable quarters, adjacent to this room are a bar and a barber's shop. Staterooms are ranged on either side of the bridge-house and are supplied with everything to suit the modern taste. Several of the rooms are arranged with two berths only, others with four, but the majority are suited for only three passengers and are heated throughout by a perfect system of steam heating which is introduced into every class of living and sleeping apartment without distinction. Ample lavatory accommodation is provided, as well as bath-rooms fitted with hot and cold and spray baths. As a promenade the most suitable place is the roof of the house, which gives an uninterrupted walk of 150 ft. on each side and being about 25 ft. above the sea is well protected from the spray. On this deck on either side are placed many of the lifeboats which are in quantity and size to suit the Board of Trade regulations for the large number of people that can be carried. The second-class rooms are placed on the main deck aft, and like the first are replete with modern conveniences. A large and comfortable smoke-room with a companion house on the deck above are arranged solely for this class, and the dining-room is capable of dining about 150 at one time, the tables being arranged to suit each 16 people. Baths and other lavatory necessaries are placed further aft in the vessel and kept distinct by steel bulkheads keeping the living and sleeping rooms quite free from any impure air. The large number of steerage passengers are well catered for, and in the vessel are placed in staterooms on the main deck, and the sanitary affairs are also well looked after. In a vessel of this type a large and experienced staff must of necessity be carried while a goodly portion of the vessel is devoted to their use and the larger number are housed in the forward portion of the vessel. On the upper deck are ranged the cattle stalls and every consideration for the carriage and care of these will be provided. Separate rooms for the cattlemen are arranged at each end, and their foremen are berthed amidships. Part of the 'tween decks will be set apart for refrigerating chambers for the storage of perishable goods and also a chamber specially prepared for consumable goods for the passengers use on the voyage. A powerful installation of electric lighting, including cargo lamps, will be supplied and introduced into each place requiring to be lighted. The auxiliary machinery for navigating and working the vessel are supplied by our best known manufacturers, and precaution from damage to cargo by fire assured by a system of piping supplied with steam being introduced into each cargo space. After the launch the *Castilian* was taken to the finishing berth where she will receive her machinery which has also been constructed by Messrs. Workman, Clark & Co., Limited, under the survey of the British Corporation, and which will be capable of maintaining a high rate of speed throughout the voyage. A number of those present at the launch then proceeded down Belfast Lough to join the s.s. *Workman* which was about to undergo her trial at the hands of the same builders.

Launch.—GERMAN.

Bärenfels.—On Wednesday, October 5th the Flensburg Shipbuilding Co. launched from their yard a large steel screw steamer which they are constructing to the order of the Deutsche Dampfschiff-fahrts Gesellschaft Hansa Bremen. The vessel is built of Siemens-Martin steel to the highest class in Lloyd's Register. She is 432 ft. in length, by 54 ft. beam, by 31 ft. depth moulded to spar-deck, and will be rigged as a schooner. The engines are of the four crank quadruple expansion type, 210 lbs. working pressure, also built by the Flensburg Shipbuilding Co. The vessel will be supplied with a very complete installation of machinery for working the cargo, eight steam winches, two steam cranes, twelve light derricks, and one to lift 25 tons. As the vessel left the ways she was named *Bärenfels*, the christening ceremony being performed by Miss Meier.

TRIAL TRIPS.

Glenmorven.—On September 24th the North Eastern Marine Engineering Co., Limited, Wallsend, having converted the engines of the large steamer *Glenmorven*, owned by Messrs. Lindsay, Gracie & Co., of Newcastle, the vessel proceeded to sea to test her engines on the measured mile course off the Tyne, a number of marine experts and gentlemen connected with the shipping trade being on board. During a series of runs, the full pressure of steam was easily maintained, and the vessel behaved splendidly, her engines working smoothly and without vibration, a mean speed of 11 knots being easily obtained.

Ceres.—On September 27th the steel screw-steamer *Ceres*, built by Messrs. Wm. Gray & Co., Limited, for Messrs. Schmidt & Hansen, of Flensburg, went for her trial trip. The steamer has been built for the timber and general cargo trade, and takes Lloyd's highest class. Her dimensions are:—Length over all, 280 ft.; breadth, 39 ft.; depth, 18 ft. 2 in. She has a half poop, raised quarter deck, and partial awning deck, with houses on deck for cabins. The hull is built with deep framing and cellular double bottom, and the equipment is of the most improved description, including steam windlass, steam steering gear, four steam winches, &c. She is fitted with triple-expansion engines, manufactured at the Central Marine Engine Works of Wm. Gray & Co., Limited, having cylinders 19 in., 30½ in., and 51 in., with a piston stroke of 36 in. Steam is supplied by two steam boilers working at a pressure of 160 lbs. per square inch. Captain Schmidt, the managing owner, was present, as was also Mr. Casper, of West Hartlepool, by whose firm the transaction has been carried through, and these gentlemen expressed themselves as being highly satisfied with the results of the trial. The shipbuilders were represented by Captain Murrell, and the engine works by Mr. W. C. Borrowman. The vessel was fully loaded, having a cargo of coal for Cronstadt.

Lady Joicey.—On October 1st this vessel, which has been built by Messrs. Short Brothers, Sunderland, to the order of Messrs. Taylor & Sanderson, Sunderland, went on her trial trip with very satisfactory results. After adjusting compasses, a series of runs was made over the measured mile when a mean speed of 10¾ knots was easily maintained. This handsome vessel has been constructed under special survey to the highest class in Lloyd's Register, the material being Siemens-Martin steel. The dimensions of the vessel are:—Length, 361 ft.; breadth, 45·15 ft.; and depth, moulded, 26 ft. 9 in., with poop bridge and topgallant forecastle. The engines, which are by Messrs. W. Allan & Co., Limited, Sunderland, have cylinders 25 in., 40 in., and 67 in., with a stroke of 45 in., steam being supplied by two large steel boilers working at 160 lbs. pressure.

May.—On October 1st, the steel screw-steamer *May*, 237.5 ft. by 34.15 ft. by 16.7, depth moulded, with a registered tonnage of 1,415 tons, and classed 100 A1 at Lloyd's, which was launched on September 28th from the shipyard of Messrs. John Scott & Co., Kinghorn, went on her official trial trip, and made a successful run, attaining a speed of 13 knots per hour, the test being made on the measured mile at Aberlady Bay. The engines, which are of the triple-expansion type, also made by Scott & Co., worked with perfect smoothness, steam being plenteously supplied by two large marine boilers. The owners, Messrs. Bailey & Leetham, of Hull and London, were represented on this occasion by Mr. L. S. Stephenson, engineer superintendent, and Captain John Grant, who will sail the vessel; the builders by Mr. Crawford and his two sons. This vessel has been specially built for Messrs. Bailey & Leetham's passenger and cargo trade between London and St. Petersburg. Accommodation of the most modern description is provided for 60 first-class passengers. The loading and discharging of cargoes has had special attention, eight powerful steam winches being provided for this purpose.

Heathdene.—On October 5th the *Heathdene*, a turret steamer, had her trial trip, when a speed of 12 knots an hour was registered by the log. No hitch was experienced in the working of any of the appliances of the vessel, and the general success of the trial was matter for mutual congratulations. The *Heathdene*, which is a sister ship to the *Laureldene*, has been built to the order of Messrs. Lunn & Co. by Messrs. R. and W. Hawthorn, Leslie & Co., after Doxford's patent turret type, and is 340 ft. in length by 45.6 ft. in extreme breadth. The moulded depth is 27.3 ft., and the loaded draught 21 ft. 8½ in. Registered tonnage, 3,541; net tonnage, 2,285; N.H.P., 300; I.H.P., 1,350. The engines have been supplied by Messrs. T. Richardson & Sons, and the sizes of the cylinders are 24 in., 39 in., and 66 in. respectively. The boilers are unusually large, the pressure being 160 lb. The ship is fitted with specially deep tanks adapted for water ballast

Florida.—On October 5th the large new steamer *Florida* left the Tyne on a trial trip. This vessel has been built by Messrs. W. Dobson & Co., Low Walker, for the United Steamship Co., Copenhagen, and is of the following dimensions:—Length, 393 ft.; breadth, 48 ft.; and depth, moulded to spar deck, 30 ft. 7½ ins. She has a deadweight carrying capacity of 7,000 tons. Engines of large power have been fitted by the North Eastern Marine Engineering Co., Wallsend, and steam is supplied by two large boilers working at 180 lb. pressure and fitted with forced draught. During the day exhaustive trials of speed and consumption were made. The results were very satisfactory, the vessel attaining a speed of 13½ knots, which was considerably over the guaranteed speed.

Lewisham.—On Thursday, October 6th, the s.s. *Lewisham*, built by Messrs. W. Gray & Co., Limited, West Hartlepool, to the order of Messrs. Watts, Watts & Co., of London, went on her trial trip. She is of the following dimensions:—Length overall, 329 ft.; breadth, 47 ft.; depth, 23 ft. 3 in., and carries 4,560 tons. She has a very complete outfit of deck gear and engines by Messrs. Blair & Co., Limited, of Stockton-on-Tees, with cylinders 23 in., 38 in., and 62½ in. diameter, with a piston stroke of 42 in., supplied by steam at the working pressure of 160 lbs. per square inch from two large steel boilers. Mr. F. Spence, the Company's superintendent engineer, was on board, and the vessel attained a speed of over 10¼ knots per hour, everything working most satisfactorily.

Mancunia.—On Thursday, October 6th, the steamer *Mancunia* went on her trial trip, and afterwards left in ballast for Bluefields, Nicaragua, under the command of Captain E. Wattley, who set out on the voyage with the cheers and best wishes of a distinguished party of over 50 ladies and gentlemen which went off on the trial trip. The *Mancunia*, of which we gave full particulars in our August issue, page 208, has been built by Messrs. Wm. Gray & Co., Limited, West Hartlepool, to the order of Messrs. Sivewright, Bacon & Co., for the Manchester and Salford Steamship Co., Limited, of Manchester. She is the first vessel fitted with patent side ballast tanks, and although she is in other respects a splendid and handsome vessel, it is no doubt that the special interest taken in her is due to the new system of ballasting introduced for the first time in her construction. In most vessels proceeding on a voyage in ballast it is found necessary to supplement the water ballast by placing rubbish or other additional ballast on board, and it is found to make the vessel easier in a sea way when part of it is placed higher up in the ship than the bottom tanks. This makes the ship more manageable and improves the speed. Ballast taken on board in this way, however, is costly and inconvenient. In the *Mancunia* the side tanks provide a ready means of efficient ballasting, completely under control, which can be filled or emptied without hindering the loading or discharging of cargo, and so avoid the loss of time which frequently occurs in putting rubbish ballast on board. The *Mancunia* will take Lloyd's highest class. Her length overall is 362 ft., breadth 51 ft., depth 27 ft., and deadweight capacity 6,220 tons. The cabins are in houses on the bridge, and a special outfit of 10 steam winches and derricks are fitted to enable cargo to be dealt with most expeditiously. The cellular double bottom extends throughout the ship, and the after peak is also fitted for water ballast, which with the side ballast tanks of over 700 tons capacity make a total of 1,700 tons. This will immerse the vessel and so reduce the risk of the machinery being strained by the propeller "racing" in heavy weather. The side tanks extend over a length of 191 ft., and add greatly to the strength of the vessel, as well as to her safety by reason of the double shell, while the stowage space is rendered more valuable by the absence of all projecting stringers, webs, and beams, which in ordinary vessels greatly impede stowage. She is fitted with a fine set of triple-expansion engines from the Central Marine Engine Works of the builders, the cylinders being 25½ in., 40½ in., and 67 in. in diameter respectively, with a piston stroke of 45 in. Steam is supplied by three boilers, which work at a pressure of 170 lbs. per square inch. After the usual manœuvring of the vessel for adjustment of compasses, a full speed trial was made, an average of 11 knots being recorded. When the party had given due attention to the lunch, which was served on board by Mr. Ducksbury, of the Royal Hotel, Captain Murrell proposed success to the *Mancunia*, to which Sir Thos. Richardson, chairman of the Manchester and Salford Steamship Co., responded. Captain Bacon proposed the health of Mr. Henry Head, representative of underwriters, to which Mr. Head replied. Sir Thos. Richardson proposed success to the Manchester Canal, to which Mr. Bythell, the chairman of the Canal company, replied. Sir Thomas also proposed continued success to the builders, to which Mr. McGlashan and Captain Murrell replied. Other toasts followed. In addition to those already named there were present among others:—Mr. F. Head, London. From Manchester—Messrs. Marshall Stevens, Herbert Gibson, Pickwick, Alderman N. Bradley, J.P., H. Bradley, J. L. Hall, J. L. Willing, H. Watson, T. M. York, W. Browning, W. H. Hunter, John Walker, C. Harvey. From Oldham—T. Parker, J. H. Hague, J. Chadwick, A. Andrew. From Dumfries—James Houston, Jno. Wilson, G. Royle (Port Said), H. Greenwell (Sunderland), J. Moorhead (Middlesbro'), J. Shaw, Provost (Dalbeatty), Jno. Tweddell (Eaglescliffe), W. Newman (Louth). From West Hartlepool—Messrs. W. Sivewright, F. Sivewright, W. C. Borrowman, F. Purvis, W. A. Smith, Captain Watson (dock master), W. B. Foxton, C.C., Ley Charlton, Jno. Steel, W. H. Loveridge, H. Lamb, J. Pybus, J. Burden, and Captain E. W. Crisp.

Rippingham Grange.—On October 6th the new steamer, *Rippingham Grange*, the latest addition to Messrs. Houlder Bros. & Co.'s fleet, had her trial trip in Belfast Lough previous to leaving for Newport to load for her maiden voyage to the River Plate. The *Rippingham Grange* is the sixth vessel built by Messrs. Workman, Clark & Co., Limited, of Belfast, for this firm, and like her predecessors, is designed for the various trades that Messrs. Houlder's large and well-known fleet engage in, the principal ports in South America, Australia, East and West Africa, being brought in connection with our own leading shipping centres. The highest class at Lloyd's is complied with, as also the Board of Trade requirements for carrying a large number of first and second class passengers, and the vessel is subdivided into watertight compartments in excess of Lloyd's requirements, as well as having an entire double bottom suitable for carrying water ballast, the peaks also being utilized for this purpose. In order to discharge the enormous cargo with rapidity and ease, 10 derricks, each capable of lifting weights up to 10 tons, are provided, and with these are 11 powerful steam winches exhausting into a separate condenser. These have been specially designed for this vessel, and extra powerful winches are placed on the poop and forecastle for warping purposes. For specially heavy lifts, such as boilers and locomotives, a separate derrick is provided. In view of the distant voyages undertaken the coal carrying capacity has been given special consideration, and suitable provision made for carrying a very large amount. As the vessel will be largely engaged in the carrying of frozen mutton on her homeward voyages she has been insulated in the most approved manner in several of the holds, and the refrigerators are similar to those already fitted in Messrs. Houlder's fleet. A chamber for carrying the more perishable goods for the passengers' use on the voyage is fitted up convenient to the refrigerating room. The appliances for navigating the vessel are of the most approved type; a steam steering gear is fitted, as is also a hand gear in a separate house aft, and with the other auxiliary machinery supplied serve to make the vessel as complete as possible both for navigating and cargo purposes. The passenger accommodation is placed amidships, and is contained in a large steel deckhouse extending for the greater length of the bridge deck, the roof forming a very spacious promenade, being practically clear of obstructions. A large number of cattle can be carried on the upper deck. In view of the possibility that the vessel may be employed on transport service she has been lighted for and aft in the 'tween decks. Electric lighting is introduced throughout the vessel wherever light is required, and clusters for the cargo hatches and arc lamps for night loading are also supplied. To ventilate the enclosed bridge space a powerful fan is introduced, which keeps this space at a level temperature. The machinery is similar to that of the *Denton Grange*, and will indicate upwards of 3,200 H.P. It is of the modern triple-expansion type, with the most recent improvements in auxiliaries introduced. In addition to the three main boilers, a donkey boiler working at the full boiler pressure is placed in the stokehold, and is available for either the main engines or supplying steam to the deck machinery. On the trial mile an average speed of 13½ knots was attained.

Princess of Wales.—On October 8th the paddle steamer *Princess of Wales*, built and engined by Messrs. Laird Bros., Birkenhead, underwent her official trials on the Clyde with very satisfactory results. The vessel, which has been built to the order of the South Eastern Railway Co. for their service between Folkestone and Boulogne, is 270 ft. by 32 ft. beam, and is fitted with compound diagonal engines of considerable power. The trial was eminently satisfactory in every way, a mean speed of 19·1 knots being obtained on six consecutive runs on the measured mile. During the course of the construction Messrs. Laird Bros. have benefitted by the experience of Captain Boxer and Mr. Gay, the company's representatives, and Mr. Kelson, who has acted as technical adviser. These gentlemen were present on board during the trial, and expressed their entire satisfaction with the results obtained, the speed being in excess of that contracted for, and there being an entire absence of vibration.

L. H. Carl.—On Friday, October 14th, the fine steel screw steamer *L. H. Carl* left the port of the Hartlepools for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, for Mr. L. H. Carl, of Copenhagen. She takes Lloyd's highest class, and is of the following dimensions, viz.—Length over all, 290 ft.; breadth, 40 ft.; depth, 20 ft. 6 ins. Triple-expansion engines having cylinders 21 ins., 33 ins., and 56 ins., diameter by 36 in. piston stroke, have been supplied by the Central Marine Engine Works of Wm. Gray & Co. The boilers are two in number, working at a pressure of 160 lbs. per square inch. The trial was a very satisfactory one, a capital run being made to Blyth, at which port the vessel loads for Copenhagen.

H.M.S. Pactolus.—On October 18th the *Pactolus* cruiser, built by Sir W. G. Armstrong, Whitworth & Co., and engined by Messrs. John Penn & Son, in her final full-power trial obtained, in the teeth of a rough sea, the highest I.H.P. yet recorded for a vessel of her class. The results were as follows:—Draught of water, forward, 11 ft. 9 in., aft, 15 ft. 8 in.; speed of ship, 20·5 knots; steam pressure in boilers, 253 lbs. per square inch; air pressure in stokeholds, 3·3 in.; vacuum in condensers—23·2 starboard, 23·9 port; revolutions per minute—216·1 starboard, 211·6 port; mean I.H.P. (for four hours)—3,639 starboard, 3,562 port—total 7,201. The contract stipulated for a speed of 20 knots, with 7,000 I.H.P., under forced draught. The *Pactolus* returned to Chatham for her machinery to be opened out for inspection preparatory to the vessel being passed into the Medway Fleet Reserve.

Saint Quentin.—On October 18th the s.s. *Saint Quentin*, which has been built to the order of Messrs. Rankin, Gilmour & Co., of Liverpool, by C. S. Swan & Hunter, Limited, was taken to sea for her trial trip, and attained a mean speed of 12½ knots on the measured mile, which was considered highly satisfactory. The principal dimensions of the vessel are:—Length between perpendiculars 335 ft., beam 48 ft., and depth 26 ft. 10 ins., and she will carry a deadweight cargo of 5,900 tons on a light draught of water. A special feature in the design of the vessel is her large measurement capacity, being able to load 7,850 tons at 45 cubic feet per ton. The engines have been built by the Wallsend Slipway and Engineering Co., Limited, and have cylinders 23½ in., 38½ in., and 66 in. diameter, with a stroke of 45 in. The owners were represented by Captain Davey and Mr. Reid, their marine and engine superintendents, who expressed themselves highly satisfied with the ship and her machinery. After the trial the vessel proceeded on her voyage to America.

H.M.S. Avon.—On October 19th the torpedo-boat destroyer *Avon* went out on her trial trip, and the results of the three hours' trial were officially reported at Chatham as follows:—Draught of water, forward, 5 ft. 2¼ in., aft, 8 ft. 3¼ in.; speed of ship, 30·164 knots; steam pressure in boilers, 225 lbs. per square inch; air pressure in stokeholds 3·75 in.; vacuum in condensers, 22·1 starboard, 22·4 port; revolutions per minute, 388·8 starboard, 380·4 port; mean I.H.P., 3,105 starboard, 3,138 port—total, 6,243. The contract stipulated for 30 knots with 6,000 H.P. The speed was considered good, having regard to the choppy sea which prevailed when the trial took place. The *Avon* will now be prepared for her gun trials.

Veritas.—On October 19th this steel cargo steamer, built by Laxevaags Engineering and Shipbuilding Co., Bergen, Norway, went on her trial trip. Built to the order of Mr. Harald Frgens, Bergen, and to Norwegian *Veritas* highest class. She is of the following dimensions:—Length, extreme 245 ft.; breadth, 32 ft.; depth, moulded, 16 ft. 1 in. She is 1133·18 brutto register tons. The engines are of the triple-expansion type, about 630 I.H.P., and the average speed 10½ knots. The main stop valve on the boiler is provided with Mr. Bower's patent rapid closing apparatus from deck as well as engine-room, which worked most excellently. The vessel and her machinery has been built under the superintendence of Mr. C. Dahm, of this city, and there were present on the trial trip the owner, Mr. H. Frgens, and a large company of ladies and gentlemen. The trial was in every way a complete success.

Bengalia.—On October 20th the s.s. *Bengalia*, the largest cargo steamer yet built on the Clyde, ran her trial trip in the Firth. She has been built and engined by Messrs Alex. Stephen & Sons, Linthouse, Glasgow, to the order of Sir Christopher Furness for the Hamburg-American Company, Hamburg, and is a vessel of 500 ft. in length, with a cargo capacity of about 20,000 tons, and fitted for carrying about 900 head of cattle. All the arrangements for these are of the best and most modern description. The accommodation for captain, officers, crew, and cattlemen is excellent, and the provision for ventilation throughout the entire ship is very perfect. The steam and hand steering gear and patent rudder brake are by J. Hastie & Co., of Greenock, who also constructed the Wilson & Pirrie patent elastic quadrant. The machinery consists of a set of triple-expansion, surface-condensing engines, having cylinders 30 in., 50 in., and 83 in. diameter, by 60 in. stroke of piston. steam is supplied by four large boilers fitted with Howden's forced draught, and working at a pressure of 180 lbs. per square inch. The boilers are constructed under the rules of Lloyd's Board of Trade, and the Hamburg Police Building Board. The engine-room contains a number of auxiliary engines, such as two Weir's feed pumps, centrifugal circulating pump by Drysdale & Co.; two service duplex pumps, Worthington Admiralty pattern; duplex pump for pumping fresh water to cattle; also Quiggin's combined evaporator and winch condenser. A large pulsometer is fitted as a ballast pump. The propeller blades are of Parson's manganese bronze. For discharging cargo 14 powerful winches are fitted on deck, one main boiler being used as an auxiliary boiler in port. Mr. Meyer and Mr. Blumenthal, of the Hamburg-America Co., were present at the trial, which was a very satisfactory one in every respect. The ship has been completed under the superintendence of Mr. van der Smissen, assisted by Mr. Brandt, and is commanded by Captain Pietsch. A duplicate steamer is in course of construction at Linthouse to the order of Sir Christopher Furness for the same owners.

Longbenton.—On October 21st the screw steamer *Longbenton*, which is 218 ft. in length by 30 ft. beam, and has been built for Messrs. T. & W. Smith, of Newcastle-on-Tyne, by the Blyth Shipbuilding Co., Limited, went to sea for her trial trip. The engines have been fitted by the North-Eastern Engineering Co., Limited, and have cylinders 17 in., 28 in., and 46 in. by 30 in. stroke. The trial of speed, notwithstanding the heavy sea running, was highly satisfactory to the owners and all interested. The *Longbenton*, under the command of Captain Sapp, sailed for Amsterdam. During construction the hull of the vessel has been built under the inspection of Mr. Andrew Lynn, of Newcastle.

Chicago.—On Friday, October 21st, the fine Atlantic liner *Chicago*, built by Messrs. Furness, Withy & Co., Limited, West Hartlepool, for the fleet of the well-known Wilson Line of Hull, was taken out for her official trip. She left at six o'clock in the morning with a large staff of officials on board for a twelve hours' run. The *Chicago* is somewhat similar in design to the s.s. *Victoria* and *Rapidam*, both of which have proved so successful. Probably one of the most exhaustive trial trips that has been made out of the port was successfully carried through on this occasion, to the satisfaction of all concerned, 13, 14, and 15 knots having been reported in progressive trials. At these speeds there appeared to be such an abundance of steam that Mr. Borrowman, who represented the builders of the engines (Central Marine Engine Works, West Hartlepool), was appealed to by the company to see what the vessel really could do when fully opened out, and on her return passage from Blyth to the Tyne, over the Whitley measured mile, the very satisfactory speed of 16¾ knots was attained. The steering and general handiness of this huge 500 ft. vessel during the day was remarked upon, she being repeatedly turned round and put upon her course in 3½ minutes. The *Chicago* carries about 850 head of cattle, these being entirely clear of the passenger accommodation. She has 12,000 tons measurement capacity. On completion of the trial trip, the vessel was taken to the Tyne for loading purposes.

Acara.—Lately the steamer *Acara*, built by the Palmers' Shipbuilding & Iron Co., Limited, to the order of Mr. James M. Wood, of Liverpool, has been taken out for her official steam trials. During the trials the engines worked in a highly satisfactory manner at 71 revolutions per minute, and a mean speed of 12 knots was attained on the measured mile.

Klondyke.—Lately the new steam fleeter *Klondyke*, belonging to the Hull Steam Fishing and Ice Co., went out for her trial trip. The vessel was built by Messrs. Cook, Welton & Gemmell. The engines, which are of the triple-expansion type, are by Messrs. Amos & Smith. The *Klondyke*, by the way she moved on her trial trip, should prove a very speedy ship. Mr. Beath superintended the trials on behalf of the owning company.

Fernhurst.—Lately the recently launched steamer *Fernhurst*, built for Messrs. Banks, Ratcliffe & Potts, of Liverpool, ran her trials over the measured mile in the Firth of Tay. Her principal dimensions are:—Length, 198 ft.: breadth, 30 ft.; and depth moulded, 15 ft. 1 in. She is fitted with engines by Messrs. Whyte & Mair, Dundee, having cylinders 15½ in., 25 in., and 41 ins. diameter, with 27-in. stroke, steam being supplied from a large steel boiler working at 160 lb. pressure. The mean speed of 10 knots was attained after several runs across the distance posts, and the managing owner of the vessel, Mr. Potts, together with Mr. Fernie, of Liverpool, his superintending engineer, appeared well satisfied with the vessel's performances.

Limari.—Lately the new screw-steamer *Limari*, which Messrs. John Reid & Co., Limited, Whiteinch, have built for the Compania Sud Americana de Vapores, Valparaiso, ran her trials in the Firth of Clyde. The vessel, which is almost a duplicate of the *Palena*, launched lately from the same yard, is as fine a specimen of her type as the Clyde can produce, fully maintaining the record of good work which the builders have accomplished, both at Port Glasgow and Whiteinch, for the company. The *Limari* is intended for mail, passenger, and cargo service on the West Coast of South America, and everything that the experience of the officials has proved to be essential is included in her equipment. She is 365 ft. long, built of steel to Lloyd's highest class, and fitted with a cellular double bottom for water ballast. Her two upper decks are almost exclusively devoted to the accommodation of passengers. There is a complete installation of electric light. The machinery, which has been constructed by Messrs. Dunsmore & Jackson, Govan, is of the triple-expansion type, with cylinders 28 in., 45 in., and 74 in. diameter, and a stroke of 54 in. The *Limari*, which is the thirteenth vessel of this class alone Messrs. Reid have built for the same owners, attained a speed of 15 knots.

Silurian.—Lately the new steamer *Silurian* went over he measured mile course at Whitley for delivery to her owners, Messrs. Owen & Watkin Williams, of Cardiff. The vessel has been built by Messrs. R. Craggs & Sons, Tees Dockyard, Middlesbrough, and is designed to carry about 1,500 tons coal deadweight upon 14 ft. draught on a net register of 450 tons. Her principal dimensions are:—Length, 228 ft.; breadth, 32½ ft.; and depth, moulded, 16 ft. 1½ in. She is fitted with poop, bridge, and forecastle, four large hatchways, four steam winches, and multitubular donkey boiler. The hatches are specially designed to be self-trimming. The trials resulted in a mean speed of 9½ knots. The machinery is of the usual triple-expansion type, having cylinders 16 in., 26 in., and 43 in. in diameter by 30 in. stroke, with large boiler working at 160 lb. pressure, constructed by Messrs. M'Coll & Pollock, of Sunderland. Mr. Owen Williams, who was himself present on behalf of the owners, expressed himself highly satisfied with the vessel and her machinery.

Reviews.

The Marine Superintendent's Pocket Book. London: John Scott & Co., 1898.

The publishers of this pocket-book have started on quite a new track. The work they have done will certainly appeal to the large class whose business lies with the details of fleets of steamers. The main part of the volume is occupied with a repetition of a very carefully designed form. Two pages facing one another are occupied by this. The left hand page has rough sketches of a steamer in plan, in elevation, and in half midship section. Here the various arrangements of each individual steamer in the fleet can be marked off, so as to show the number and arrangement of decks, tanks, houses, and bulkheads as well as her capacity for coal, cargo and water ballast in the spaces variously appropriated for these things. On the opposite page is room for the entry of other particulars of ships such as dimensions, date, signal letters, official-number, rig, and in fact all the data found in the register books and even in the most elaborate particulars of sale, some of which, such as the ship's yard number, which would probably only be found in her builder's books. Details as to accommodation, as well for crew and cattlemen as for passengers, and of her cargo appliances, such as hatches and derricks, are remembered, engineering features are also provided for, and the auxiliary machinery and performance of the vessel are not forgotten. The man who enters in their proper place every particular suggested to him here will know all about the ship. It might be well, however, to remember that in these pages there is no provision for an entry as to the date of installation of the parts enumerated. It may very well be that though a ship may be comparatively old her boilers may be recent, or that her engines may have been modernised, or that electric light has been introduced. Possibly writing in matters known to be outside the original design in red ink would overcome the difficulty. Altogether provision is made in the book for the exhaustive detailing of the peculiarities of fifty ships. A number of blank pages are appended to enable the owner of the book to set out there any further information which may strike him as worthy of record. The book commences with an explanation of the abbreviations adopted and with a view of the tables of weights and measures most likely to be useful to those who will use it. To such the measured mile speed table may be cited as especially useful.

Scale Sheet Drawings. By. A. W. F. Lougman and A. Whittier. London. Edward Arnold & Co.

TWENTY large and boldly drawn diagrams on sheets upwards of two feet long, and proportionately broad, are here afforded, and with them a little book entitled "Notes on Method," which is designed to accompany the drawings which we are told are intended to aid in the teaching of the correct principles of scale drawing. The suggestion is made that merely copying these drawings is not enough, that exercise should be largely supplemented by blackboard sketches. The use of models in wood or in cardboard of the various diagrams is also recommended. Great weight is very properly laid on the importance of seeing that the scholar always inserts the dimensions of the parts in the drawings. The notes give useful aids to the best method of learning to copy the drawings, and to use the appliances on which the draughtsman relies. Altogether it seems a careful and practical publication.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from August 2nd to October 6th, 1898.

16600 G. and F. L. Watson. Furnaces for steam boilers.
16602 T. Oxley. Drums for holding electric cables.
16605 J. Lewis. Rolling sole for trawl board.
16656 Sir W. G. Armstrong, Whitworth & Co., Limited, and R. Matthews. Ammunition hoists.
16663 J. Rowe. Pipes and tubes.
16668 E. Gearing. Welding of tubes.
16683 W. W. Corey, jun. Steam pumps.
16724 C. Crapell-Fontaine. Drawing tube for boilers.
16752 G. R. Sisterson. Fixing water-tubes for boilers.
16824 F. Brix. Propelling vessels.
16832 H. H. Lake. (T. S. Miller, United States.) Transhipment of coal.
16839 B. W. G. McVickers. Preventing disaster in marine collisions.
16843 A. C. Franklin. Steam engine indicator.
16886 P. Ferror. Tubulous boiler.
16922 B. Draper and W. and T. D. Bayliff. Bulkhead doors.
16934 J. P. Hall. Pumps for feeding boilers.
16956 A. Lagrafel and J. F. M. J. D'Allest. Steam generators.
16975 G. Huckauf. Rotary steam engines.
17037 W. Cooke. Screw propeller constructions.
17045 H. Simpson. Arresting the motion of vessels
17046 J. Proctor. Mechanical stokers.
17124 W. Fairweather. (D. Pyl, Holland.) Steam engines.
17128 D. W. Crosland. Propelling launches by gas.
17133 W. Burnett and W. Gammie. Trawl fishing.
17147 P. A. Newton. (C. C. Worthington, United States.) Pumps.
17151 W. G. Armstrong, Whitworth & Co., Limited, E. W. Lloyd and L. Newitt. Launching torpedoes.
17160 T. M. Oxford. Sight-feed lubricators.
17187 T. Coulthard. Vertical boilers.
17198 A. J. Boult. (G. Dubuisson, Belgium.) Funnels.
17264 J. Y. Johnson. (The Societe Anonyme du Temple, France.) Water-tube boiler.
17265 J. Y. Johnson. (The Société Anonyme du Temple, France.) Water-tube steam generators.
17276 E. T. Moroney. Water-gauges for boilers.
17336 F. von Grabinski. Vibrating piston engine.
17365 J. G. Wallikes. Valves for steam boilers.
17430 W. May and The Pulsometer Engineering Co., Limited. Sirens.
17435 C. D. Abel. (J. King, C. Downes, and M. A. Iwan, Argentine Republic.) Heating feed-water.
17443 A. Von Knorring. Closing water-tight doors.
17452 R. C. G. Staats and W. Coates. Propeller.
17468 F. G. Blott. Self-acting swimming propellers.
17469 D. J. Morgan. Propeller or tail shafts.
17435 C. N. Faurie. Rotary engines.
17526 M. L. E. Duval. Multitubular boilers.
17530 J. F. Gibb. Bearing for lubricating shafts.
17548 T. Moodie. Closing water-tight doors.
17569 W. P. Thompson. (J. Ciocki, Germany.) Propelling ships.
17589 A. F. Evans. Screw propellers.
17599 P. Eilert. Steam traps.
17606 T. L. Taylor. Preventing propellers racing.
17625 A. N. Chamberlain and Hoskins & Son, Limited. Berths.
17685 S. Knapman. Trawl nets for fishing.
17725 W. Williams and S. Redfern. Steam traps.
17754 C. W. Pinkney. Internal combustion engine.
17755 C. W. Pinkney. Governing engines.
17770 C. A. Mc Evoy. Indicating speed of ships.
17788 T. Barcroft, J. Smalley, and S. Redfern. Friction clutch.
17796 R. Cockburn. Steam traps.
17818 W. J. Roberts and J. R. Jones. Utilising tidal power.
17849 W. Hinchliffe. Internal lids for feed-water heaters.
17850 W. J. Ellis. Self-acting gauge.
17944 J. I. Thornycroft, J. Donaldson, and D. Croll. Steam generators.
17969 A. E. Hills. Manufacturing flanged tubes.
17970 F. Brunt. Friction clutch.
17991 B. J. Hammersley and The Empire Seamless Steel Tube Co., Limited. Seamless tubes.
17995 F. W. Bradley. Cleaning tubes.
18053. N. Bottone. Preventing collisions at sea in foggy weather.
18068 W. E. Heys. (The Firm of Schaffer and Budenberg, Germany.) Pressure gauges.
18106 F. Gebhardt. Combined rule and compass.
18138 W. P. Thompson. (J. A. Stevens, United States.) Steam boilers.
18166 J. and A. Niclausse. Steam generators.
18208 R. T. Brond. Water indicator for boilers.
18221 J. B. Sample. Capstans.
18240 R. H. Woodcock. Propulsion of vessels.
18247 J. G. C. Flawse. Determining the position of ships.
18278 R. G. Brooke. Steam traps.
18307 W. P. Little. Rotary engines or pumps.
18324 P. C. Johnson. Contracting steam in pipes.
18356 J. Durnford. Torpedo nets.
18375 J. Bonicard. Rotary steam engines.
18385 R. Perrin. Automatic steam generator.
18399 C. F. A. Bell. Valve for pumps.
18417 P. F. Dundon. Steam generators.
18452 H. C. Capel. Internal combustion engines.
18469 G. Wilson. Apparatus for propelling.
18471 F. H. Lester. Alarm pressure gauges.
18504 E. Edwards. (Jean, France.) Life-saving belts.
18518 H. Siller and P. Halfmann. Steam boilers.
18529 R. Cockburn. Feed-water heaters.
18540 E. P. Woillard. Reversing steam turbines.
18565 W. J. Wright. Raising feed-water heaters.
18571 H. E. Newton. (C. C. Worthington, United States). Steam engines.
18576 G. R. Sisterson. Heating feed-water.
18577 C. G. Theleen. Protecting the bows of vessels.
18578 J. S. C. Nichols. Stopping the motion of vessels.
18596 H. Hopkins. Pumps.
18597 G. Evans. Piston-rods.
18600 H. Steven. Valve gear for steam engines.
18669 W. P. Thompson. (H. F. Loos, Germany.) Lubricators.
18676 H. L. J. C. Turc. Navigable vessels.
18692 T. L. W. Ginger. Draw-off valve for vessels.
18696 J. Wezel. Boiler furnaces and feeders.
18744 F. Kaufhold. Lubricating pistons, &c.
18749 W. E. Plummer and W. M. B. Kermode. Metallic packing mechanism.
18753 E. Lacoine. Determining the position of vessels in fog.
18756 J. G. Lorrain. (B. Burleigh, Soudan.) Collapsible boats.
18758 A. Vesely and J. Hejtmanek. Ship's propellers.
18763 A. Fletcher. Ship's rudders.
18774 H. C. Gearing. Speed regulating governors.
18795 W. Elliott and Elliott & Garood, Limited. Marine pumping engines.
18856 W. H. Fitzgerald. Boats.
18879 T. H. Cobley. Boilers.
18882 G. Kempf. Preventing collisions of ships.
18918 E. B. Bright and B. Nash. Detaching barnacles from vessels.

E. L. Blosse. (B. Demanet, Belgium.) Removing incrustation in boilers.
J. Greenwood. Lubricators.
W. Baines. Internal combustion engines.
S. Kershaw. Ships' water-closets.
F. Buchanan. Screw propeller.
J. A. Young. Cleaning ships' bottoms.
J. Whitley and J. T. Short. Piston valves.
H. Workman. Economisers for steam boilers.
C. Damand. Insubmergible vessels.
G. H. Rayner (G. Reeves, Argentine Republic). Ships.
J. Stumpf. Valve gearing with governor.
A. Matthews. Water ballast tanks.
W. Wilkinson. Preventing sea-sickness.
J. H. C. Leuty. Raising sunken vessels.
G. H. Jones. Defence against torpedoes.
A. J. Browne and T. H. Bishop. Water tube for boilers.
W. W. and W. T. Tucker. Steam generators.
W. Mc Causland. Swimming gloves.
G. Quellmann. Arranging ships' propellers.
F. Lehmann, jun. Resistance of ships.
H. A. T. Stoakes. Steam traps.
O. Frühling. Dredging apparatus.
M. Paul. Feed-heating apparatus.
E. A. Mitchell. Internal combustion engines.
J. A. Rowe and F. J. Trewent. Automatically discharging guns of warships.
G. H. Watson and E. J. Noble. Steam boilers.
F. Hull. Method of shipping boat rudders.
J. Pointon. Cleaning ships' bottoms.
G. K. Gandy. Buoyant boat cover.
E. Capitaine. Packing rings for pistons.
S. C. Davidson. Supporting shafts in frames.
F. J. Weiss. Water-feed apparatus for boilers.
I. S. McDougall, T. Sugden and N. N. Haigh. Steam traps.
J. Allan. Metallic packing for joints.
J. Carson. Pumps.
G. L. Scott. Friction clutch.
M. Pallaversich. Steering navigable vessels.
W. Robinson. Preventing ships rolling.
W. R. Lake (The McKenzie Furnace Co., United States). Grates for steam boiler furnaces.
J. Wild. Compasses.
H. Mechan. Manhole covers.
J. T. Rossiter. Steam engines.
J. B. Furneaux. Steam boilers.
S. C. Davidson. Centrifugal fans and pumps.
C. Bennet (R. B. Dixon, Canada.) Rotary engines.
J. Cleghorn and T. Wilkinson. Dredgers for canals.
T. Cooper. Steering barges.
E. Williams. Steam turbines.
E. G. Camelinat and P. Taillandier. Cables.
J. Schmucker. Means for steering vessels.
J. E. Robinson. Corliss engine valve gear.
C. W. G. Little. Steam engines.
J. R. Bell. Transhipping fuel, &c., at sea.
G. A. Mussbaum. Steam generators.
A. E. Ballan. Shipment of coal.
W. H. Griffiths. Valves.
L. M. Chapman and J. M. Gelatt. Lock-nuts.
H. D. and P. Layman, and F. W. Parpart. Boats.
A. J. Boult (N. A. Christensen, United States). Pumps.
J. Budge. Regulating the oil supply to engines.
E. H. Hamilton. Discharging of naval ordnance.
J. Slater and R. & W. Hawthorn, Leslie & Co., Limited. Actuating tube expanders.
W. P. Thompson (C. Bonafide, Italy). Funnel.
H. L. and M. J. Freeman. Steam generators.
L. Brennan. Cylinders and pistons.
R. Arnott. Steam engines.
J. Kippax. Preventing incrustation in boilers.
C. Pellenz. Masts.
D. M. Metford. Floats for fishing purposes.
T. V. Trew. Constructing ships' rudders.
W. T. Quinsey and J. H. Simmons. Boat.
J. A. Saner. Propelling navigable vessels.
A. Shaw. Packing cylinder stuffing-boxes.
T. W. Halgell and J. Stevenson. Ships' berth.

20048 C. and A. Edmeston. Steam traps.
20098 R. J. Rae. Ships' propellers.
20099 J. H. K. McCollum. Steam turbines.
20103 A. J. Boult (J. M. Terme, France). Brush for cleaning tubes of boilers.
20104 M. H. C. Shann. Propulsion of vessels.
20106 S. Quincey. Rotary engines.
20138 J. Cooper. Boiler furnaces.
20153 J. Dale. Ships' rudders.
20161 E. R. S. Bartleet. Fishing cast cases.
20236 W. T. Moss. Compasses.
20246 J. Murrie. Anti-friction journals.
20269 A. R. Upward. Propeller for light craft.
20300 J. Doherty. Lubricators.
20336 W. R. Littlefield. Funnel.
20340 H. H. Lake (E. S. T. Kennedy, United States). Boilers.
20364 A. Köppe. Furnace for steam boilers.
20373 P. J. Partridge. Feed pump for boilers.
20414 J. Corp. Propeller shafts for steamships.
20427 A. Austin. Propulsion of ships.
20489 F. J. Pilcher. Ladder for ships' use.
20515 G. Barker (A. Gariel, Italy). Fittings of water-gauge glasses.
20561 B. W. Tucker. Steam generator furnaces.
20589 F. Edwards. Feed pumps.
20606 E. Lünd. Registering revolutions of engines.
20695 R. G. Petway. Anti-friction bearings.
20710 J. T. Jepson. Metallic packings.
20711 H. J. Gold. Metallic packing ring for stuffing-boxes.
20720 J. S. Boyle. Refrigerating chambers for fishing vessels.
20728 E. D. Hopcroft. Removing scale from boilers.
20736 J. Gobey and J. Bloomfield. Trawl gear.
20743 W. Mullan. Manhole covers.
20787 H. R. Mortell. Otter boards for trawl nets.
20794 R. Von Horváth and M. Cohn. Electric signalling apparatus for ships.
20840 S. Lake. Floating stranded vessels.
20875 A. J. Boult (O. D. Orvis, United States). Furnaces.
20886 E. E. Wigzell. High-speed engines.
20902 N. B. Hamilton. Cleaners for boiler flues.
20912 J. A. Sumner. Feeders for steam boilers.
20963 H. R. Mortell. Otter board for trawl nets.
21036 M. Pratt. Steering vessels.
21037 M. Pratt. Steering vessels.
21040 G. K. B. Elphinstone. Indicating speed.
21080 J. Metcalfe. Valves.
21094 W. and J. J. Hardy. Fishing tackle.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

August 20th, 1898 (*continued.*)		
Hale, Alfred ..	2C	Liverpool
Heron, C.......	1C	Glasgow
Hesketh, J. E.	2C	Cardiff
Hetherington, J.	2C	N.Shields
Hughes, T. L...	2C	,,
Hutchinson, B.	2C	London
Irvine, Jas. A...	2C	Glasgow
John, David....	1C	Cardiff
Lillystone, Hy.	1C	W.H'pool
Maybrick, J. C.	2C	Liverpool
M'Ewan, A. D.	1C	Glasgow
Osborne, Thos.	2C	,,
Perry, Thos. ..	2C	W. H'pool
Prentice, Jno...	2C	Glasgow
Ramsay, David	2C	,,
Reed, Wm. S...	1C	W. H'pool
Reid, Robert ..	2C	Glasgow
Renfrew, Robert	1C	,,
Robertson, A. H.	1C	Dundee
Robinson, P. ..	2C	London
Robinson, R. W.	1C	,,
Salter, Thos. ..	1C	Plymouth
Sinclair, C. R.	1C	N.Shields
Stanley, W. H.	1C	Liverpool
Steel, Thos. H.	2C	Cardiff
Stewart, Chas.	2C	Glasgow
Stock, Chas. L.	1C	London
Taylor, R. R. ..	2C	W.H'pool
Watson, Arthur	1C	Glasgow
Webber, Rbt. B.	2C	W.H'pool
White, Jsph. L.	2C	,,
Wilkinson, E. F.	2C	N.Shields
Williams, J. H.	2C	London
Young, Jno. R.	1C	N.Shields
Young, Samuel	2C	Glasgow
August 27th, 1898.		
Angus, John S.	2C	S'nd'rl'nd
Armstrong, R.J.	2C	N.Shields
Barclay, John J.	1C	Aberdeen
Bath, Henry J.	2C	S'nd'rl'nd
Burnop, John T.	1C	,,
Byrne, A. W...	1C	Liverpool
Charlton, W. C.	2C	N.Shields
Collins, E. D...	2C	,,
Cullen, Alexr...	2C	,,
Cuthbert, Wm.	1C	Aberdeen
Davidson, J. D.	2C	,,
Dotchin, James	1C	N.Shields
Foster, F. H. ..	2C	London
Hardy, John A.	1C	N.Shields
Hawkins, C. ..	1C	London
Henderson, C ..	2C	Aberdeen

Hewitt, R. F.	2C	Liverpool
Jackson, Wm.	2C	Hull
Lloyd, V. E. E.	1C	N.Shields
M'Uririck, D.	1C	Liverpool
Mills, G. A.	2C	,,
Muir, Alexr. P.	1C	N.Shields
Park, G. M.	2C	,,
Seymour, A. N.	2C	Cork
Seymour, E. S.	2C	Hull
Stephenson, J. G.	2C	N.Shields
Thomas, Geo. E.	1C	Aberdeen
Turnbull, Robt.	2C	N.Shields
Ward, Edward	2C	Liverpool
Warren, W. G.	1C	London
Weeks, C. M.	2C	Cork

September 3rd, 1898.

Ayres, Thos. H.	2C	Liverpool
Beharrie, J. R.	2C	Glasgow
Black, James	1C	,,
Bowran, John	2C	N.Shields
Davies, P. R. M.	1C	Liverpool
Delaney, F. H.	2C	Cardiff
Duncan, J. B.	2C	Glasgow
Emerson, R. W.	2C	Cardiff
Farquhar, Geo.	2C	Glasgow
Ferguson, J. M.	1C	,,
Gibson. H. J.	2C	London
Gibson, J. A.	2C	Glasgow
Govan, Arthur	2C	Liverpool
Grace, Henry C.	2C	Cardiff
Hartley, Wm.	2C	N.Shields
Henry, John C.	2C	London
Hewitt, J. G.	1C	Liverpool
Hick, Charles	2C	London
Hutchfield, R.T.	2C	N.Shields
Jacques, Geo. L.	2C	Liverpool
Krohn, Fredk.	2C	Glasgow
Laidler, Wm.W.	2C	N.Shields
Lawton, John	2C	Liverpool
Macgregor, R.	2C	Glasgow
Miller, Robert	2C	,,
Morgan, T. G.	2C	Cardiff
Mountain, J. D.	2C	N.Shields
Norman, T. S.	1C	London
Price, Sidney A.	1C	Cardiff
Purvis, Richard	2C	N.Shields
Roberts, D. T.	2C	Cardiff
Rowles, H. P.	2C	N.Shields
Seath, John	2C	Glasgow
Sharpe, Alex. T.	1C	,,
Smith, J. B.	2C	N.Shields
Speirs, J. P.	1C	Glasgow
Stevenson, A.	1C	N.Shields
Stewart, D. B.	1C	Glasgow
Wesencraft. A.E	2C	N.Shields
Whitesmith, W.	2C	Glasgow
Williams, Ralph	2C	Cardiff

September 10th, 1898.

Bearpark, John	1C	N.Shields
Burns, Matthew	2C	Dublin
Church, R. C. H.	1C	N.Shields
Day, Edwin H.	2C	London
Dugdale, W. N.	2C	Liverpool
Forbes, C. W.	1C	,,
Gordon, Wm.	2C	N.Shields
Hall, Wm. W.	1C	,,
Jennings, John	2C	Liverpool
Kerruish, Fredk.	2C	,,
Livingston, F.	2C	,,
Parkes, John	1C	,,
Potts, Athol S.	2C	N.Shields
Robson, Alfred	1C	,,
Sharp, Henry U.	1C	London
Shepheard, G.H.	2C	,,
Stewart, A. A.	2C	,,
Swan, Wm. T.	2C	N.Shields
Taylor, A. C. H.	2C	London

September 17th, 1898.

Anderson, Wm.	2C	Liverpool
Bado, Anthony	2C	Greenock
Ball, Arthur W.	2C	London
Biggam, F. M'E	2C	Leith
Black, Hugh	1C	Greenock
Brown, J. W. G.	2C	Liverpool
Bunting, W. R.	2C	Belfast
Cochrane, F. S.	1C	Liverpool
Crosling, J. G.	2C	N.Shields
Ditchburn, T. A.	1C	Leith
Donaldson, W.M	1C	,,
Donald, Wm.	1C	Greenock
Donald, Wm. C.	1C	London
Duff, Robt.	1C	Greenock
Easson, James	1C	Leith
Elder, Geo. V.	2C	Greenock
Forrest, James	2C	London
Glen, James	2C	Leith
Henderson, A.A.	1C	Greenock
Horner, Jacob	1C	N.Shields
Howard, John	1C	,,
Hunter, A. W.	2C	London
Hurst, Harry S.	2C	Hull
Little, Gilbert S.	2C	Liverpool
MacDonald, W.B	2C	Greenock
Mager, Thos.	2C	,,
M'Intyre, Hugh	1C	,,
M'Rostie, Peter	1C	,,
Murray, Alex.	1C	N.Shields
Musgrave, Evers	1C	London
Naylor, Wm. J.	1C	,,
Neil, James	2C	Greenock
Nicholson, W.	1C	N.Shields
Page, George	2C	,,
Park, James	2C	Greenock
Robinson, Chas.	2C	Liverpool
Rooker, P. Wm.	1C	,,
Salt, Henry J.	2C	N.Shields
Sharp, Ephraim	2C	London
Smith, Joseph	1C	N.Shields
Spencer, H. B.	2C	Liverpool
Stokes, C. R.	1C	London
Verner, Arthur	2C	Belfast
Wheatley, W.	2C	N.Shields
Wigley, Lewis	2C	London
Zanmit, A.	1C	,,

September 24th, 1898.

Allingham, T.N.	1C	London
Arthur, John L.	2C	Cardiff
Batts, Walter	2C	,,
Billinton, Percy	2C	London
Brown, James	2C	Glasgow
Cambourn, T. A.	2C	London
Cripps, Mark	2C	N.Shields
Cullen, John W.	1C	Glasgow
Davie, James A.	1C	London
Dobson, Thos. S.	1C	Cardiff
Duff, Thos.	2C	Glasgow
Dunn, John	1C	,,
Fairbridge, R.W.	2C	N.Shields
Fenwick, Fredk.	2C	,,
Fothergill, J. M.	1C	,,
Gasson, K. J.	1C	Liverpool
Gibb, Wm.	2C	Glasgow
Gilchrist, J. W.	2C	,,
Gray, Wm. O.	1C	Dundee
Hodgson, W.W.	1C	Liverpool
Houston, David	2C	W.H'pool
Hudson, Walter	1C	London
Johnston, G.W.	2C	Liverpool
Jones, Geo. H.	2C	Cardiff
Keay, William	2C	Dundee
King, Peter S.	1C	Glasgow
Kipping, F. E.	2C	N.Shields
Kirkus, R. W.	1C	Liverpool
Kydd, Wm.	1C	Glasgow
Lee, Geo. P.	2C	London
Lewis, Owen T.	2C	Cardiff
Lloyd, Jno. T.	1C	,,
Macfarlane, A.	1C	W.H'pool
Macraild, D.	2C	Glasgow
Mead, S. C.	2C	London
Melville, G. D.	2C	Dundee
Metcalfe, Simon	2C	N.Shields
Middleton, Geo.	1C	W.H'pool
Munro, Alex.	2C	Glasgow
Muse, Wm.	2C	N.Shields
Nicholson, G.B.	1C	,,
Owens, Wm.	2C	Liverpool
Patterson, Wm.	1C	Cardiff
Perrott, F. J.	2C	S'hmpton
Phillips, T. C.	2C	Cardiff
Pluck, Robert F.	2C	London
Prentice, E. E.	1C	W.H'pool
Price, David L.	2C	Cardiff
Read, E. W.	1C	,,
Rupp, Peter	2C	Glasgow
Smith, James C.	1C	Liverpool
Talbot, Wm. E.	2C	Cardiff
Towns, Charles	1C	W.H'pool
Watkins, H. W.	2C	Cardiff
Weatherill, E.T.	1C	N.Shields
White, Ernest D.	2C	Cardiff
Wildsmith, E.G.	2C	W. H'pool
Wrate, Chas. E.	1C	,,

October 1st, 1898.

Adamson, P. A.	1C	Liverpool
Andrew, George	2C	Sunderl'd
Bullmore, F. C.	2C	Falmouth
Burgess, F.	2C	Sunderl'd
Butterfield, W.	1C	London
Drewet, M.	2C	Hull
Finney, Patrick	1C	London
Garland, H. J.	2C	,,
Gibson, T. J.	2C	,,
Gilbertson, J. E.	2C	N.Shields
Gordon, Samuel	1C	Liverpool
Grant, Garden	1C	N.Shields
Hardy, Arthur	1C	,,
Harrow, Alexr.	2C	Aberdeen
Holder, H. Wm.	2C	Hull
Hudson, C. J.	2C	London
Hughaw, John	2C	Lndndrry
Imray, John D.	1C	Aberdeen
Jobling, Alfred	2C	Sunderl'd
Legget, Jas. F.	2C	Liverpool
Macdonald, J.M.	2C	London
Martin, Henry	1C	Aberdeen
Murray, R. W.	2C	N.Shields
Nichol, Josepb	2C	,,
Phillpot, J. W.	1C	Sunderl'd
Piggford, J.	1C	,,
Roberts, A. F.	1C	London
Robertson, W.C.	2C	,,
Robinson, R. J.	1C	Sunderl'd
Roger, Hugh	1C	London
Shakle, Lewis	1C	,,
Taylor, Alf. E.	2C	,,
Thirkell, W. V.	2C	N.Shields
Walker, T. M.	1C	Sunderl'd
Watson, Samuel	2C	Aberdeen
Wilson, Ernest	1C	Sunderl'd

October 8th, 1898.

Baker, Henry	1C	N.Shields
Biddle, E. W. S.	2C	Cardiff
Buckland, W.H.	2C	,,
Campbell, J. D.	1C	Glasgow
Cook, Wm. H.	2C	London
Coulson, John	2C	N.Shields
Curran, Wm. E.	2C	Cardiff
Darling, Jas. D.	2C	Glasgow
Edwards, Thos.	2C	Liverpool
Ferguson, H.M'L	2C	Glasgow
Guthrie, James	2C	,,
Haines, F. W.	2C	N.Shields
Hunter, Wm.	2C	,,
Jarvis, Thos. H.	1C	London
Kerr, Donald	1C	Glasgow
Leveson, W. A.	2C	Cardiff
Linn, Thos.	1C	Liverpool
Lowrie, H. L.	2C	London
Macnab, Wm.	2C	Glasgow
M'Dermott, J.H.	2C	Liverpool
Meiklejohn, J.B.	2C	Glasgow
Myhre, Christn.	2C	Cardiff
Nicoll, Harry	2C	,,
Perry, Jas. C.	2C	Glasgow
Pilmer, John G.	1C	N.Shields
Polley, Wm. E.	1C	Glasgow
Robertson, J.R.	2C	N.Shields
Stewart, Wm.	1C	London
Swinburne, W.	2C	N.Shields
Watt, Adam G.	2C	Liverpool
Young, John	2C	Glasgow

October 15th, 1898.

Alderson, W. J.	2C	London
Alexander, T.A.	1C	N.Shields
Archbold, John	2C	,,
Baxter, Wm. M.	2C	Hull
Borthwick, Geo.	1C	Leith
Firth, Geo.	2C	Hull
Francis, Wm.E.	2C	London
Frew, Wm.	1C	Greenock
Gordon, Alex.	2C	Dublin
Hanick, John	2C	London
Hyndman, Thos.	1C	,,
Mayor, Wm. R.	2C	Greenock
M'Lean, Alexr.	2C	,,
M'Naboe, John	1C	Liverpool
Moore, Wm. P.	2C	London
Murray, John	2C	Greenock
Ostler, James	2C	,,
Paterson, Arthur	1C	,,
Patrick, Alex.	1C	Dublin
Pender, Harry	1C	Greenock
Reid, Geo. Alex.	1C	London
Roche, Jas. M.	2C	N.Shields
Scoffield, Walter	2C	Hull
Stubbs, W. H.	2C	London
Swaine, Wm. E.	1C	Liverpool
Thearle, Jas. E.	2C	,,
Wallace, Jas.	1C	Leith
Wells, H. H. M.	2C	London

Rankin's Cements.—In our issue of December, 1897, we gave a short notice relating to the cements manufactured by Messrs. R. & J. Rankin, of the Union Foundry, 22, Manchester Street, Liverpool. We have just seen copies of testimonials received from users of the cement, which speak very highly as to it efficiency and usefulness. In one case a leaky marine boile was treated with it, with the result that the boiler inspector agreed to postpone the lifting of the boiler from the seat as he originally intended, in view of the marked effect of the cement on the leaks. We have no doubt that as its merits are more appreciated, its use will be widely extended.

River Transfer Steamer.—The largest boat ever launched on the Mississippi slid off the ways at the Iowa Iron Works, Dubaque, Iowa, on the 18th September. She is a transfer steamer built for the Texas and Pacific Railroad Company to be used at New Orlean,

The Marine Engineer.

LONDON, DECEMBER 1, 1898.

THE Workmen's Compensation Act of 1897, which came into operation on the 1st of July last, is by far the most important legislative step which has been taken in recent years as regards the relationship between employer and employed; not merely on account of the new principles of law which it involves, but the probability of its extension to other workmen in the near future. This statute is applicable to marine engineers in employment in workshops, and probably, also, in the fitting, alteration, and repair of engines, machinery and boilers in steamships, but not to sea-going engineers, because, according to section 7, it extends to employment on, or in, or about engineering work. This term is stated to mean "any work of construction, or alteration, or repair of a railroad, harbour, dock, canal or sewer, and includes any other work for the construction, alteration, or repair of which machinery driven by steam, water, or other mechanical power is used." The word "workman" mentioned in the Act includes every individual who is engaged in an employment to which this statute applies, whether by manual labour or otherwise. Under this definition, managers, clerks, and other persons occupying positions of importance in such an employment, and not generally designated workmen, will be included. We will now mention a few facts to better enable our readers to comprehend the main, among other reasons, why the rates for insuring marine engineers under the Act are so much greater than under the Employers' Liability Act of 1880, or at common law. In the first place, three of the leading defences under this last-named statute and at common law which employers could use against the claims of workmen to recover compensation, are firstly, that the injuries they sustained in the ordinary course of their work for which compensation was claimed, resulted from risks to which they exposed themselves with their knowledge and voluntarily; secondly, misadventure or unavoidable accident; and thirdly, their own contributory negligence. Now, under the Workmen's Compensation Act these defences cannot be pleaded. If, nevertheless, the injury which a workman suffers in the ordinary course of his employment has been caused by his serious and wilful misconduct, his master is not liable to pay compensation for it. Again, if in any employment to which this statute applies, personal injury, disabling a workman for at least a fortnight, results to him by accident, arising out of and in course of such employment, the employer is liable to pay up to to £300 if death is caused by this accident, or £1 per week if he is disabled. Now, of the different kinds of disablement there is the permanent total, in which the accident prevents the operative from working, and the permanent partial, when he is still able to work to some degree. The compensation for the former disablement, which is defined by the Act, may amount to half his wages for the remainder of his life, while the latter kind of disablement subjects his master to an unknown liability. On the contrary, the amount of compensation recoverable under the Employers' Liability Act is not to exceed such sum as may be equivalent to the estimated earnings during the three years preceding the injury of a person in the same grade during that period in a similar employment, and in the district wherein the workman is employed when the injury occurred. The rates charged for the insurance of the liability of marine engineers under the Workmen's Compensation Act by the tariff insurance companies are about 30s. per cent. on the amount of wages annually paid for those employed in workshops, and 45s. per cent. for those engaged in fitting, altering, and repairing marine engines and machinery connected therewith in ships. Some of the non-tariff insurance companies charge very much lower rates than their rivals, while others of the former class charge nearly as much. If, however, the employers of marine engineers wish to limit their insurance to their liability under the Employers' Liability Act and at common law up to the extent of three years' earnings, then the premiums charged by both classes of the insurance companies will only be about 2s. 6d. per cent. The employer is, under the Workmen's Compensation Act, to be liable to the employees of sub-contractors for personal accidents unless the work is only ancillary, or incidental to, and is no part of, or process in the trade or business of the employer. The latter, however, is entitled to be indemnified by the sub-contractors. In the debate relating to the Act, in the House of Lords, the Lord Chancellor stated that the clause which provided that the employer should have his right of indemnity against the sub-contractor would cause no difficulty when the latter was a man of substance, but in its operation the clause would tend to crush out smaller and struggling sub-contractors. In answer to this alleged grievance, we have no hesitation in declaring that these persons are under the absolute necessity of insuring their liability to prevent their financial ruin. As regards contracting out of this Act, it is provided by section 3, that if the Registrar of Friendly Societies, after ascertaining the views of the employer and workmen, certifies that any scheme of compensation, benefit, or insurance for such workmen, and whether or not the scheme includes other employers and their workmen is, on the whole, not less favourable to the general body of the latter and their dependants, than the provisions of the Act, the employer may contract until the certificate is revoked; that the provisions of the scheme shall be substituted for those of the statute, and then the employer shall only be liable in accordance with the scheme. No scheme shall be thus certified which contains an obligation upon the workmen to join it as a condition of their hiring. A scheme has been certified under the Workmen's Compensation Act for the benefit of marine engineers. Under it, while the legal representatives of men and apprentices obtain less compensation for fatal accidents than under the statute, and the men and apprentices rather less during incapacity for work arising from accident, these lower benefits are thought to be more than counterbalanced by the additional ones to those in the Act, and which former benefits are, (*a*) Compensation for accidents caused by serious and wilful misconduct of workmen, and (*b*) Payment to commence from the date of the accident instead of a fortnight afterwards. A modification of this scheme, the latter of which has been approved by the actuarial staff of the Friendly Societies central office, has worked successfully for more than nine years. Lastly, the importance of employers insuring their risks of liability for compensation to marine engineers with insurance companies of first-class financial soundness cannot be exaggerated. Such companies are those which can be relied upon, both at the present time and subsequently, to discharge every financial contract it may have entered into, however long this obligation may endure.

THE sudden sinking of the s.s. *Mohegan* with the lamentable loss of life attending it, has drawn forcible attention to the apparent inadequacy of the usual boat-lowering appliances or life-saving apparatus for immediate use, even in comparatively smooth weather, in face of the very small time that now elapses between the destruction of part of the hull of a modern passenger vessel and its absolute foundering. It is curious that in view of the entire alteration of conditions in the modern passenger liner and its liability, after collision or serious injury, to foundering in so small a period of time, that the old davits and lowering tackle still remain in use without the necessary modifications that would appear to be inevitable to meet new conditions. The reports on such disasters—that the vessel had such a list to port or starboard that the boats on that side of the vessel could not be lowered, or that the davit tackle was frozen, or that the boats were stove in, or capsized in lowering owing to haste and confusion—is surely a reflection upon marine architects or engineers that such tackle, liable to such failures under the conditions where their perfect action is most necessary, should still be in use. A heavy list, so obviously to be anticipated after collision, should not interfere with the lowering of any boats. If it does, the mode and appliances for launching of the boats requires immediate revision. The boats should be capable of being launched on either side, and should be capable of being launched to such a distance from the ship's side on touching water that they are not liable to being staved in before a crew has command of them. Davits are probably obsolete as fulfilling modern conditions for prompt launching. The present tackle and unhooking simultaneously fore and aft is just the class of appliance to go wrong under emergency. Why should the boats not be launched bow outwards from the side of the vessel with sufficient way on them to clear the hull to avoid all risk of staving in? We submit this query and all the considerations involved in the question of a fresh departure in appliances for launching boats in an emergency, to our many capable and inventive readers.

AT a meeting of the Institute of Marine Engineers on October 10th, an interesting paper was read at short notice by the Honorary Secretary, Mr. James Adamson, upon a given title of the "Marine Engineer." Very properly Mr. Adamson considered that the essence of a good marine engineer depends largely upon his early training. This is a subject of much controversy, but a first essential may be defined as a good mental and physical condition and a desire towards engineering science, the tendency of the mind towards accurate investigations and conclusions being fostered by a study of the exact sciences, such as mathematics, physics, chemistry, and geology. Apparently sixteen appears to be about the average age at which a lad is expected to be ready to start his practical and technical education. Owing to the multiplication of machines for doing work formerly done by hand, the apprentice does not have such opportunities as heretofore to handle tools, which in the engine-room is so essential. This lack of opportunity is sought to be amended in technical schools, but at present very inadequately. In Keyham College, however, work done in the College is transferred to the erecting shops and ships to stand the test of actual wear and experience. It is suggested, by Mr. Adamson, that an extra or third-class examination and certificate should be given to juniors as an incentive to effort, when they have reached certain qualifications. There is a tendency, bad for the apprentice, to keep him in workshops too closely to one department or set of tools during the whole of his time. The good all-round man should be able to turn his hand to the forge, the plane, the chisel or file, or to boiler caulking and patching with equal adaptability. It is by no means necessary that apprenticeship to qualify for a marine engineer, should be served in a marine-engineer shop, as was confirmed by Mr. W. Lawrie in discussion, who said the best engineer he ever sailed with served his time in a blacksmith's shop. At the same time, it is at least admissible that there should be some service in connection with marine engine building or repairing. Mr. Alderman G. W. Kidd, in discussion, went so far as to state that in the average shop apprentices were not even taught engineering. A good repairing shop turned out far better engineers for sea-going work than large engineering establishments. With the abolition of indentures, much of the old spirit that bound the apprentice to his master has disappeared, and much now devolves, in Mr. Adamson's opinion, upon the employers and the chief and second engineer's careful thought for, and personal interest in the apprentices and juniors under their care, which opinion was confirmed by many speakers in discussion. Mr. Adamson fears that the craze for economy which has set in of late years is proving of great disadvantage to the marine engineer, leading as it does, to feverish haste in students or apprentices to put in the minimum time necessary for the Board of Trade certificate, and in employers to the false supposition that the less the training which a man undergoes, the cheaper he will be. A well-trained, disciplined and junior engineer is invaluable to his superior officers, to his ship, and to the owners; he can be trusted to start and see a job through satisfactorily and expeditiously, and the steps and time taken to render him so trustworthy, are worth the labour involved. With the chief engineer lies the chief responsibility as to both his engines and staff. Every ship has its own most economical speed, and when the chief has found it, it lies with him to see that his staff maintain that uniformity of speed to effect the greatest economy. As Mr. Halliday said, in discussion, it should be the aim of each chief to feel a pride in the juniors trained under him and that such service should be a source of pride to the juniors.

CAIRD AND RAYNER'S NEW FEED-HEATER.

It will be seen that the feed-heater which this firm now makes is new in several particulars and the design has been entirely changed. Formerly the tubes went spirally round the whole circumference; now each tube has a separate coil of its own. The effect of causing the steam to go through a long length of tube will be seen in the table of results given below. The feed-heater consists of a cylindrical vessel of wrought-iron, inside of which is placed a series of coils of seamless copper tubes. The feed-heater is so placed that the feed-water is forced through on its way to the boiler from the feed-pump. The feed-water enters by a branch pipe at the bottom and leaves it by a similar branch at the top, and when it has reached the bottom its temperature is very little different from that of the water coming in, and the condensed water from the coils is led to the hot-well and pumped back into the boiler. The heating coils are of special length to allow the steam plenty of time to part with its heat and so most of it goes into the feed-water before it is drained off into the hot-well. The steam is admitted by a branch at the side of the dome on the top, from which it passes down through the coils to the dome at the bottom. The condensed steam is led away to the hot-well. The feed-water enters the heater by the branch at the lower end, and passing through a passage in the centre of this dome surrounds the coil, is heated, and goes through a passage in the centre of the upper dome to the flanged connection to the main feed-pipe. There is provision made in the inlet and outlet branches for ascertaining the temperature by a thermometer. A spring-loaded relief valve is fitted inside of the shell. The tubes are secured to the tube-plates by Caird & Rayner's metallic joint. The hexagon on the union prevents any straining action on the tube in screwing up the joint, and the joint itself is a valve and is tight at very high pressures.

The following table gives the boiler pressures, the temperature of the hot-well, the mean temperature, and the highest temperature of the steam used:—

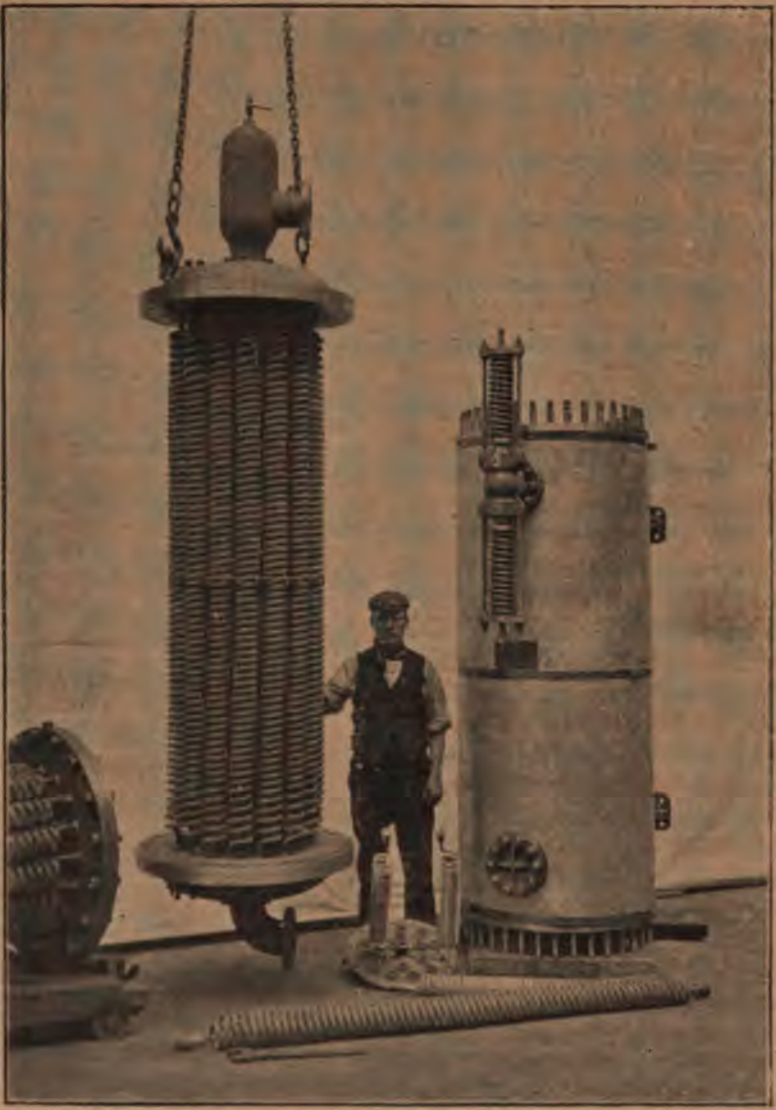
NAME OF SHIP.	MEAN OF TRIALS.				
	Boiler Pressure	Temp. of Steam used.	Temp. of Hot-well	Mean temp. of feed.	Highest temp. attained.
Dunvegan Castle ...	163	374	67	230	254
Tintagel ,, ...	162	370	62	218	239
Avondale ,, ...	160	370	62	219	237
Donolly ,, ...	161	370	68	224	236
Raglan ,, ...	170	376	68	225	236
Braemar ,, ...	193	384	65	230	290
Carisbrooke ,, ...	196	388	67	252	261

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*

Plymouth *v.* Southampton.

SOME little time ago I expressed the opinion that thanks to the local management of the Devonian port and to the lukewarm support afforded to it by the Great Western Railway Company, there was very little hope for the success of Plymouth in its struggle with Southampton. Some glimmering of this kind seems to have penetrated the minds of the Plymouthians themselves. Desperate ills they concluded demand desperate remedies. So a letter on the evils of Southampton was drafted and circulated. This precious document was accompanied by a chart drawn on the distorted plan which railway companies sometimes adopt to show that their line has a mathematically direct course to every important centre, whilst all rival lines have to wander aimlessly over the face of the country to reach their objective. The chart was intended to suggest that Plymouth was an exceptionally safe port with no danger on any course connected with it, whilst it at the same time pointed out that its rival had a monopoly of the dangers of Ushant. This general suggestion was untrue and in bad taste, but the unhappy authors had the hardihood to proceed to particulars. Will it be believed that they raked up the story of the loss of the *Drummond Castle* to prove that Southampton was a dangerous port for mail steamers? To such a charge it was necessary to reply, and Messrs. Donald Currie & Company responded with a grave and dignified protest, accompanied by two important corrections as to the allegations of the concoctors of the circular. In the first place it was pointed out that the *Drummond Castle* was not on her last voyage sailing as a mail steamer, and more important still, was not bound to Southampton at all! She was for London direct! Shipowners have something to say as to the ports of call of their steamers even when mail contracts are entered into, and the little incident referred to is likely to cause most shipowners to shun a port whose management is directed in so base a spirit.



Caird & Rayner's New Live Steam Feed-Water Heater.

The Castle Line

seeing, I suppose, the success of Messrs. West's exhibition of animated photographs on naval subjects at St. James's Hall, in November, has hit upon a very interesting method of laying before the public inducements to fly south by sea. It has made arrangements with Messrs. Maskelyne & Cook to exhibit these realistic pictures of life at sea on a Castle Liner, and of South African views and people at the Egyptian Hall, Piccadilly. Those who are interested in South Africa (and who are not directly or indirectly) might do worse than visit the show, whilst the ships' games and the modern views of Neptune's orgies on the crossing of the line will assuredly interest every one who cares about the social life of his fellow subjects.

The Old "Alaska"

went down the Clyde to be anchored in the Gareloch on the 14th November, as there seems no occupation for her. Two days later she was reported by the harbour master at Roseneath as "sinking fast." Tugs, men and pumps were sent down in hot haste and found that the vessel had six feet of water in her engine-room. The mischief was due to a seacock which had unaccountably been left open. But fortunately the harbour master's vigilance gave sufficient warning to enable the vessel to be kept afloat.

The P. & O. Company.

If the statement now made is correct the P. & O. Company was not altogether without a reason in purchasing the three Hall

Line steamships of which I spoke last month. It is stated that the Hall Line is about to retire from the Bombay passenger trade. That announcement coupled with the purchase already noted seems to point to the conclusion that the P. & O.'s action in buying these ships helped them to get rid of a rival in their trade. Personally I should think that it is far better to wear down rivals than to buy them off. We have seen that in other trades this method of disposing of opposition has led to a constant supply of fresh competing organisations coming into the field. The directors, however, may be supposed to know their own business, and now that two large British lines—the Clan and the Hall—have retired from the competition we may see how the P. & O. gets on with its formidable bounty-assisted foreign opponents.

Messrs. Thomas Cook & Sons

have issued a circular in which they set out their arrangements for popular tours and cruises for the autumn and winter season of 1898. At page 12 of this little book I see an announcement of certain popular cruises in the Mediterranean, aboard "the Albion Steamship Company's (Limited) yachting steamer *Midnight Sun*." Here I read that the *Midnight Sun*, "a large and magnificent steam yacht of 3,178 tons and 3,500 H.P., was acquired from the eminent firm of Sir W. G. Armstrong & Co. in 1893, and was specially fitted out by them for yachting purposes, etc., etc." From other sources, however, I learn—and my readers can check the accuracy of my statement if they wish it—that in the year 1893 the *Midnight Sun* received new boilers and had her engines tripled. But if any one imagines that she was built in that year by the "eminent firm of Sir W. G. Armstrong & Co." they are mistaken. The vessel in question was built as long ago as the year 1874 by the equally "eminent firm" of Caird & Co., of Greenock. She will be better known to most people by her original name of *General Werder*, under which she served the North-German Lloyd Company for many years. She is doubtless a very good public yacht, and a very comfortable ship. But the use of the word "acquired" in the connection in which it is used in this circular is certainly not calculated to suggest the fact that she had a past before the year 1893.

A Wise Regulation.

In view of what is happening in the way of nomenclature of vessels in certain European countries, the action of the United States Government in prohibiting the use of more than one word in the name of a ship seems very wise. Experience in this country has shown that commercial operations are facilitated by the use of short words for things which need to be frequently named. In banking amalgamations the cutting short of the name of the new business has been especially noticeable. In telegrams and in office work the names of ships have to be constantly written, and both expense and labour are avoided by brevity.

It might be well if the Germans, who are a practical people, would reconsider their plan of calling their newer mail boats by such very compound names as the North-German Lloyd Company has recently adopted, and revert to the simple and convenient plan of calling their boats after rivers. Surely *Spree* was a good enough name! No one can think that she will be better-named as *Kaiserin Maria Theresa*. Yet it is announced that such a change is contemplated to bring the enlarged and improved vessel into line—as regards name—with the newer racer *Kaiser Frederick*, and *Kaiser Wilhelm der Grosse*.

Losses of Cargo Boats.

As is to be expected at the time of year, there have been a good many interesting vessels removed by accident within the last few weeks. Off the South Stack by collision with the Belfast steamship *Voltaic* there was sunk the Harrison liner *Cognac*, a vessel which was built on the banks of the Mersey as long ago as the year 1860. She was well named, for in the many trips over the short course between the Mersey and the Garonne that she had made during her long life she had carried brandy as the principal part of her inward cargo. Indeed it was this fact to some extent which contributed to the fact that there was no loss of life to deplore as the casks tended to keep her afloat.

Then the dangers of single screws for West-bound cargo vessels was demonstrated by the abandonment of the fine big tramp *Westmeath*. She was but three years old, and was a vessel of nearly 7,000 tons, constructed at Newcastle by Messrs. C. S. Swan & Hunter. Yet proceeding out comparatively light she broke her propeller shaft in the tube, and thereby not only lost her propelling power, but also jammed her rudder so as to make her quite helpless. The weather was bad and she was making water. Under these circumstances up came the Allan liner *Monte Videan*. She attempted to tow the disabled vessel. But the circumstances were against her, and, after proving the impossibility of her task by breaking the best hawsers of both ships, she gave it up. The master of the *Westmeath* had the option to go aboard the *Monte Videan* or to be left in his helpless ship. A wise discretion was certainly exercised in abandoning her.

There has been lost at the Longships a vessel named the *Blue Jacket*, which had previous bad luck. It may be remembered that in January of the present year she caught fire when discharging her cargo at Harwich, and was with some difficulty beached at that port. The fire was then extinguished. But the ship was much damaged, and both her master (who fell down a hatchway) and the commander of H.M.S. *Mersey* (who was aiding the work of extinguishing the fire and whose eyes were scorched by the heat) suffered serious injuries. Fortunately in her final accident the crew were saved without mishap.

Whilst mentioning disasters I may speak of the misfortune which befel the newest and largest of the Union Company's "G's," the *German*. She left Belfast on the 10th November, and was on the usual round of the vessels of her class to Continental ports, before her final sailing on the 26th November for her maiden trip to the Cape, when on the voyage from Rotterdam to Hamburg she had a collision in fog. The colliding vessel was the Wilson liner *Corso*, from Hamburg for Hull, and the accident had fatal results for her. The *Corso* was a comparatively small vessel of under a thousand tons, thus bulking barely one-eighth of the *German's* size. She was quite a new ship, having been launched but four years ago by Messrs. Priestman, of Sunderland, for Messrs. Wilson's Hamburg trade.

The North-German Lloyd Company

have sustained a great loss in the death of Herr H. H. Meier, the founder of their great and prosperous organisation. The event could hardly have been unexpected as he had attained the great age of 89 years. It was not only in connection with steamship enterprise that Herr Meier left his mark upon the recent history of his country. He was at the head of the banking affairs of the city of Bremen, and his part in the unification of the German Empire was not inconsiderable. His place in the active business of the company has, of course, for some years been small, but it is a pity that some finer steamer than the little more than cargo boat which bears his name could have been chosen to keep the memory of one so closely bound up in the life of the company constantly before the public's eye in the Fleet List.

I have had the opportunity of perusing the logs of the North-German Lloyd crack *Kaiser Wilhelm der Grosse* and am much struck by the uniformity of her running. Her best achievements seem to have passed almost unnoticed. When she first came out her logs were noted, but since then they have not been publicly referred to. Yet they are well worthy of examination. For a single day's run she took the westward record on her first trip, with a day's work of 564 miles, as well as the record for the fastest trip on the Southampton route. Homeward, 519 miles was the biggest total. Her third trip was remarkable both ways. Outwards she added three miles to her best day's performance, and homewards, she brought it up to 528 miles. But this eastward run was remarkable for other reasons. She took the Southampton record with a steaming time of 5 days 17 hours and 8 minutes, her average speed being 22·35 knots. On her sixth eastward trip she accomplished the then unprecedented distance of 535 miles in a single day. On the seventh voyage she still further improved her westward best day's run, getting in no less than 580 miles. On this homeward trip she improved her steaming time by twenty minutes. The eighth westward run was characterised by remarkably even steaming. She did 560 miles on three consecutive days, and on the fourth, was only six miles behind that distance. Her average speed on this trip was 23·07 knots, and the time occupied was forty-two minutes less than that of her best previous trip. The ninth homeward voyage showed the best average speed yet made, being 22·51 knots, while on the 8th July, she achieved the distance of 537 miles in a day's steaming to the eastward. She seems, in fact, to do better on her eastward trips than when she is going outwards, for on her tenth trip she averaged over 23 knots for three consecutive days and on one of them ran 539 miles!

French Built Steamships.

It is reported that the steamship *Nord*, built for the Calais-Dover Mail service, which came out a few weeks ago, and, as already noted here, made the fastest passage on record across the Channel, has, after all, not turned out altogether satisfactory, she has had to go back to her builders for alterations to her rudder and steering gear.

The "Times"

has only itself to thank if it gets the reputation of always belittling the British steamship services. But the other day came out a paragraph headed "The Largest Steamer." This sensational heading referred to the new steamship which the Hamburg-American Line is building for its express service. She will be named the *Deutschland*. But she will certainly not be the biggest steamer in the North Atlantic trade. I doubt whether she will by much exceed the dimensions of the *Kaiser Wilhelm der Grosse*, which, in the paragraph in question, was not mentioned. That may have been due to forgetfulness, though more probably ignorance was the reason. But she certainly will be inferior to the new White Star liner *Oceanic*, which is now nearly ready for launching, and which will very likely be actually at work before the *Deutschland* is in the water. Mere size, of course, is not everything. But a certain class of readers seem to think a good deal of it.

The White Star Line

go on increasing and improving their fleet. The 3,800 ton *Adriatic* is gone. But against this writing down we have a new cargo boat the *Afric* of about 12,000 tons launched in November, for the Atlantic trade.

Messrs. Elder, Dempster & Co.,

in spite of Bristol's own inaction and the curious want of backbone which its authorities display, are managing to re-develop the former metropolis of the west in spite of itself. They are now announcing that their service from the Avon port to Canada, hitherto weekly, shall in the future be doubled. The enterprise and management of this firm is a very remarkable feature of the steamship trade of the day, and the more closely one has the opportunity of regarding the firm's operations the more one is struck with the thoroughness of its organisation and the perfection with which it grasps every detail, however remotely, as the outsider might be apt to think, it bears upon their direct business of shipowning.

Milford Haven

has at least realised its aspirations. It has a steamer that once was a mail steamer. The old *Galicia*, recently discarded by the Pacific Steam Navigation Company, has become the property of a concern named the Canadian Steamship Company. She has been re-named the *Gaspesia*, and is now loading at Birkenhead. She sails from the Mersey on December 4th, and from Milford four days later, bound for Charlottetown, Prince Edward Island. I have not yet heard that London and South-Western Railway shares or Mersey Dock bonds have had a severe drop, but no doubt the time has come when Milford will absorb the traffic of both. It is, perhaps, a little unfortunate that the vessel is neither new, nor large, nor fast, and that she loads at one of the rival ports, but at all events, she calls at Milford, and that is enough.

The Canadian service, indeed, altogether seems a troublesome one. There are no satisfactory responses to the Canadian Government's requests for tenders, and it looks as though the 20-knot mail service was as far off as ever.

A Conversion.

The old mail steamer, *Ulster*, one of the four vessels which for a third of a century carried the mails between England and Ireland, has not terminated her career after all, when discarded by her original owners, the City of Dublin Steam Packet Company. She has had her paddles stripped off, her engines taken out, and has recommenced life as a four-masted barquentine. It will be somewhat curious to follow her new life, and to see if she prove remunerative to her enterprising owners.

Bravery of Engineers.

There was a presentation of an Albert Medal of the Second Class the other day to the engineer of her Majesty's torpedo-boat destroyer *Foam*. He performed a feat of singular daring in shutting off steam at great personal risk, after he had himself sustained serious injuries by the bursting of one of the cylinders of his engines. This feat will doubtless be more thoroughly noted in Naval Notes. But engineers as a body may pride themselves on the heroism of one of their body, whether he wears the Queen's uniform or not.

Mr. Ismay, of the White Star Line,

has rendered many services to those who go down to the sea in ships. But none of these stand more prominent than the success he has achieved in regard to the introduction of track routes across the Atlantic for the avoidance of ice, and for the minimising of the risk of collision in these waters, which are constantly becoming more and more crowded. His efforts have been quietly and persistently continued over a long series of years. As my readers all know, he some years ago obtained the assent of a number of the more important passenger lines to a scheme which has by them been rigidly adhered to since. In November he again returned to the charge, and took the chair at a meeting of shipowners—some newspapers will persist in calling them "shippers," which they certainly were not—and attempted two further objects. Of these the first was to alter the tracks hitherto observed so as to obtain the advantages shown to be possible in the light of the experience which has been accumulated. The other was to get further adherents to the track so adopted, and to consider the advisability of having obedience to the lane directions made compulsory. Whilst all men who are qualified to express an opinion unite in considering the lane routes necessary, no one but himself, with the respect which his life and work have acquired for him, could have ventured to hope for the success which a movement initiated by him has attained.

The Customs

has recently taken steps, in view of the disparity which apparently exists between the volume of our imports and exports, to include in the returns the important items of vessels built in the United Kingdom for foreign owners. After January 1st, 1899, therefore, the monthly trade returns will afford an indication of the amount of tonnage so provided for others than those who trade under our own flag.

The Annual Accounts

of the Belgian Government service between Ostend and Dover are issued. From them we may learn that the cost of the 2,354 voyages made by the steamers during the year averaged £44 per trip. But the receipts were less than half that amount, being but £21 per trip. Under these circumstances it is not surprising, especially in view of the frequent breakdowns which have been chronicled in the way of loss of floats, and even in one case the loss of a whole paddle—to learn that the loss on the year's working exceeded £54,000. This is a worse result by some £7,000 than that of the preceding year, and it may well be wondered how long the Belgian Government will be prepared to go on with this great expenditure for the privilege of having its mails carried in its own bottoms.

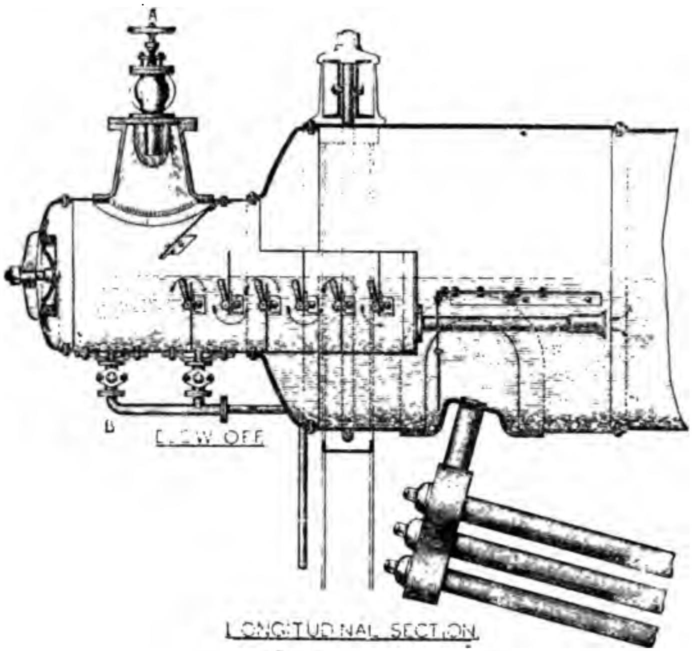
The "Mohegan" Inquiry

was commenced on November 10th. After some days' hearing it was adjourned till the 24th, and I shall not be able to give the result of the investigation in this month's notes. There have also been police-court proceedings, arising indirectly out of the disaster. Certain statements have been put about of a character reflecting very seriously on the owners of the vessel in regard to the extent of their responsibility for the catastrophe. The person who made them persisted in circulating them, and there was no course open to the representatives of the Atlantic Transport Company save to take legal proceedings. The defendant was committed for trial, heavy bail being asked for. Till that trial takes place it would not be proper for me to make any comments. All I can do is to note facts.

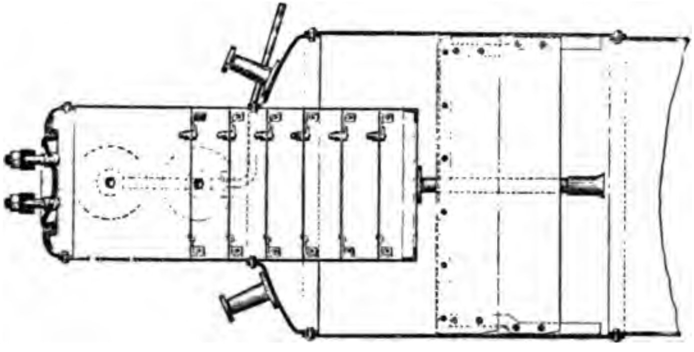
Once again truth follows closely upon fiction. In the *Warstock*, by Mr. Wirt Gerrare, published only last month, is described a wonderful machine which abolishes modern explosives. Now just such an engine as this, and acting in the same way, has been patented in the United States of America by Mr. Nicola Tesla who, by projecting into the air, electric currents of such voltages that the disturbances extend many miles, fires any explosive within the range of the electrical disturbance. This will revolutionise modern methods of warfare as Mr. Gerrare has shown in his novel.

BABCOCK AND WILCOX FEED-HEATER.

THE Babcock and Wilcox Feed-heater and Purifier consists of a smaller boiler, and is situated at the top of the boiler, and its advantage is possibly in its simplicity. It is a live steam feed-heater and purifier all in one. Other live steam feed-water heaters transmit the heat from the steam to the water through the tube walls. This one heats the water directly by contact. The feed-water is admitted at the top in the middle of the cylinder, the live steam a little to the side of this, and the purified hot feed-water is led off at each side to the header of the boiler, while the impurities and insoluble salts are blown out from below. The feed-water enters the cylinder in a fine spray, and coming in contact with steam, gets heated. The cylinder is kept half-full of water. There are adjustable vertical plates in the water space placed in a vertical direction to cause the water to move in a sinuous path to the exit pipe. All this is clearly shown in the figure. By this means the water is all brought to the surface again in contact with the steam and again gets heated. The impurities and insoluble salts separate out from the water as it rises in temperature and this separation is going on throughout the path of the water from the inlet branch to the outlet. The impurities and insoluble salts settle at the bottom of the cylinder and are blown off at intervals. Some time ago, on one of the Wilson Line steamers, a party of gentlemen were taken on board to see the boilers, and a thermometer was inserted in the water-tube leading from the feed-heater to the boiler header. The temperature as shown by the thermometer was 300° Fah.



LONGITUDINAL SECTION.



SECTIONAL PLAN.

Babcock & Wilcox Feed-Water Heater and Purifier.

The Society of Model Engineers.—Under the foregoing title, a new society has been formed, having for its objects the discussion of matters relating to the construction and working of model engines, dynamos, motors, steam and electric launches, tools, and small mechanical and electrical apparatus generally. The first meeting took place on November 2nd, at the Memorial Hall, Farringdon Street, E.C., Mr. Percival Marshall, A.I.Mech.E., presiding over a gathering of about 50 members and friends. The annual subscription to the society is 10s. 6d. and the secretary, Mr. H. Sanderson, "The Mount," Ealing, W., to whom applications for membership should be addressed.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

"Ready, Aye, Ready."

THE rumours of war which have been floating about for the past few weeks do not seem to have caused much excitement except in newspaper offices. There is none of the feverish activity and nervous haste which prevailed thirteen years ago when it was expected that we should have to fight Russia. As regards the Navy, the only preparation made was in mobilizing of the Reserve Fleet, in order to adequately protect our own shores in the absence of the Channel Squadron at Gibraltar. In 1885 a force was mobilized to practically do the work which should now be expected of the Channel Squadron, which was truly described by the Army and Navy Gazette at the time as "a menagerie of unruly and curiously assorted ships." The preparations, we are told, commenced in April, and in June a squadron put to sea for an experimental cruise. What the squadron consisted of will be seen from the following description which appeared in the same paper. "In speed, in coal endurance, in armour, armament, and such matters as handiness, sail power, torpedo equipment, and net protection, never before were such a dissimilar lot of vessels brought together for war purpurposes. Coast defence vessels, turret ships, casemates, old liners plated, and an experimental ram, form a medley, with converted merchant ships, steel cruisers, despatch vessels, gunboats, and torpedo craft." But this is all past now. We were never more ready for war. The Channel Squadron is one of the most homogeneous in the world, and the Mediterranean Squadron is only second to it. The Reserve Squadron, too, is superior to, the French Fleet assembled at Brest, which includes such vessels as the *Formidable*, *Amiral Baudin*, *Hoche*, *Duperre*, *Courbet*, *Devastation*, *Redoubtable*, *Requin*, and *Furieux*. Against them could be put the *Nile*, *Trafalgar*, *Sanspareil*, *Benbow*, *Howe*, *Rodney*, *Collingwood*, *Colossus*, *Thunderer*, *Alexandra*, and some small craft.

An All Round Advertisement.

During the recent war crisis most of the dily appears made a good deal of capital out of what they termed "Preparations for War." The news they published was merely detailed reports of the doings at the various dockyards and military centres, which can be found in almost any weekly service paper. The worst offender in this respect was a certain halfpenny daily paper. This paper, having made the most of the "Naval preparations," turned its attention to the Army, and published in its columns information to be found in every army list. Now the War Office, having done very little, thought this a good opportunity to advertise themselves, and to make it appear to the public that they were very busy indeed. Accordingly, a circular letter was sent to all the daily papers asking them to refrain from publishing news which might be of assistance to the probable enemy. The halfpenny daily in question, as it could get no really good news concerning the "Preparations for War," came out a few days later with the statement that it had resolved, on account of the circular, to publish no more naval or military information which could be of service to our enemies, and it certainly did not publish any, for there was none to publish. Result, an excellent advertisement for both the War Office and the paper. One of the most amusing reports published when the scare was on, was that from Wei-Hai-Wei, which stated that the squadron out there had cleared for action. The correspondent who telegraphed this news apparently knew very little of naval affairs, for if he had, he would have known that this evolution is a weekly one in every ship in the British Navy.

A Change of Opinion.

Advices from Cape Colony inform us that Mr. Schreiner, the Premier, has introduced a bill to the House of Assembly which provides that a sum of £30,000 per annum may be placed at the disposal of the Home Government, as a contribution towards the cost of maintaining the Imperial Navy. Therefore, Cape Colony, instead of presenting the Empire with a battleship, which would cost close upon £1,000,000, apparently intends spreading the gift over some 30 years, for it will take about this time, at £30,000 per annum, to make up the £1,000,000 proposed at first. No conditions are inserted in the Bill, nor is there any suggestion that in return the Imperial Government are to keep a warship stationed in any particular waters. This is certainly an improvement upon the gift of the Australian Colonies, which was somewhat marred by the conditions under which it was made. Sir Gordon Sprigg's original offer was one that he was scarcely empowered to make. But we should not, we are told, look a gift horse in the mouth, and so long as the Colonies take this method of recognising their obligations to the Imperial Government, it is sufficient.

Portsmouth Dockyard.

The chief event during this month in this yard was, of course, the launch of the *Formidable*, by the wife of the Chancellor of the Exchequer, and at the time of her taking the water she displaced about one-third of what she will do when she is completed, and it was arranged that as soon as she was launched, she was to go into dock to receive her armour, and therefore, there was no reason, as at other yards, why she should receive this before she was launched. There is an abundance of coal stored at this yard now, and the stacks almost reach to the top of the ventilating shafts, while the colliers are continually arriving with more. This is in striking contrast to the state of the place during the coal strike, for, despite all that was said, we were short of coal. A curious experiment was carried out at this yard recently. An American firm, it will be remembered, brought to Portsmouth, by order of the Admiralty, a sample of corn pith celluloid, which they declared to be capable of plugging a hole made by an armour-piercing shot, supposing, of course, that the celluloid is in its proper place when the shot goes through the armour, but the experimental staff of the *Excellent* argued that the enemy would fire shells, and accordingly the celluloid was placed in a tank, and a shell fired into it. The result was that the tank was so knocked about, that the stopper fell out, and no further trials have since taken place with the celluloid. One thing troubles the officials here, and that is, how to spend all the money that has been voted for use at the yard. Three months ago the authorities were instructed that some £12,000 had been saved on the current year's wages, and this has been accumulating ever since, and the only overtime that is resorted to is for special work.

There are many ways in which this money could be made use of, and why it should lay idle is a puzzle to many. The torpedo-boat destroyers *Star* and *Flying Fish* have been commissioned here to act as tenders to the *Victory*.

The German Navy.

The German naval authorities have apparently taken to heart the lesson learnt by the Spaniards at Santiago regarding the danger of fire owing to the use of wood fittings in warships. The new battleship, *Kaiser Friederich III.*, has had the whole of her decks and staircases made entirely of steel, and wood has been dispensed with in every place where men would be obliged to stand during a fight. The *Kaiser Friederich III.* is the first of a series of five first-class battleships which are all to be completed by 1902. The armament of the new vessel consists of four 9.4 in. guns, two forward and two aft, in armoured turrets, eighteen 5.9 in., twelve 3.3 in., twelve 1.4 in. quick-firing guns, and twelve 3 in. machine guns. The 5.9 in. guns are protected by turrets or casemates. Like all the new German battleships, the *Kaiser Friederich III.* has three screws, driven by three separate sets of engines, each in a water-tight compartment. Steam is generated in twelve boilers, in pairs, in six water-tight compartments. She is designed for a maximum speed of 18 knots. Altogether, she will cost £1,000,000.

Forty-five Miles an Hour.

Considerable interest attaches to the new steam turbine-driven torpedo-boat destroyer, which the Hon. C. A. Parsons is now building for the Admiralty at his shipbuilding yard on the Tyne. He also has one in hand for a foreign power. The boat is to be 200 ft. long, with an I.H.P. of 10,000, which is to enable her to steam at the very least thirty-five knots or forty miles an hour. She will be twice the length, six times the width, and is to develop a H.P. five times greater than the little *Turbinia*, which aroused such interest at the time of the great naval review twelve months ago. Although Mr. Parsons only gives thirty-five knots as the speed of the boat he has in hand, he hopes to be able to get a much higher speed, in fact, forty-five miles an hour out of her. It is noteworthy that Mr. Graydon, an American engineer of some note, proposes building a turbine-driven boat with a higher speed even than this, but instead of two propellers he would have thirty-six. He also has a scheme for applying the turbine idea to cruisers and battleships, which, if the reports can be believed, are to travel at something like thirty-five knots.

Mr. Rudyard Kipling and the Navy.

As is perhaps well known, Mr. Rudyard Kipling has been recently spending a considerable amount of time as a guest of the captain of a third-class cruiser in the Channel Squadron. The result of this has been that he has contributed to the *Morning Post* a series of articles on his experience in the Navy, entitled, "A Fleet in Being." The *Morning Post* is to be congratulated upon securing these interesting character-sketches and impressions, which are understandable by the civilian, and are a source of joy for ever to the professional reader. One or two short quotations from these articles should be read with interest. The following extract on naval engineers and the machinery of a warship is particularly good :—

"They are an amazing breed, these quiet, rather pale men, in whose hands lie the strength and power of the ship.

"'Just think what they 've got to stand up to,' says Twenty-one, with the beautiful justice of youth. 'Of course, they're trained at Keyham and all that, but fancy doing your work with an eight-inch steam-pipe in the nape of your neck, an' a dynamo buzzin' up your back, an' the whole blessed shoot whizzin' round in the pit of your stomach! Then we jump about an' curse if they don't give us enough steam. I swear I think they're no end good men in the engine-room!'

"If you doubt this, descend by the slippery steel ladders into the bluish copper-smelling haze of hurrying mechanism all crowded under the protective deck; crawl along the greasy foot-plates, and stand with your back against the lengthwise bulkhead that separates the desperately whirling twin engines. Wait under the low-browed supporting columns till the roar and the quiver has soaked into every nerve of you; till your knees loosen and your heart begins to pump. Feel the floors lift below you to the jar and batter of the defrauded propeller as it draws out of its element. Try now to read the dizzying gauge-needles or find a meaning in the rumbled signals from the bridge. Creep into the stokehold—a boiler blistering either ear as you stoop—and taste what tinned air is like for a while. Face the intolerable white glare of the opened furnace doors; get into a bunker, and see how they pass coal along and up and down; stand for five minutes with slice and 'devil' to such labour as a stoker endures for four hours. . . .

"'An' they come into the ward-room,' says Twenty-one, 'and you know they've been having a young hell of a time down below, but they never growl at us or get stuffy or anything. No end good men, I swear they are.' 'Thank you, Twenty-one,' I said. 'I'll let that stand for the whole Navy if you don't mind.'"

Devonport Dockyard.

The recent crisis did not cause any great rush of work at this yard, but stringent orders were issued forbidding anybody in the dockyard from giving journalists confidential information, but this would have been pretty hard for those in the yard to do, as very little confidential information was allowed to reach those in the yard. The *Implacable* is making tremendous progress, and she is advancing at the rate of 1,000 tons of material per month. Several cruisers and torpedo-boat destroyers are in hand in the docks and basins completing for sea, and the *Philomel*, *Niobe*, *Retribution*, and *Blonde*, will shortly hoist the pennant. At the present time all the shops in the Keyham factory are full of work, and the successful manner in which the engines of the *Proserpine* were turned out, have induced the Admiralty to sanction a similar set of propelling machinery being prepared for another cruiser which is to be built at Sheerness, but which is not yet laid down. The engines and boilers for the sloop *Rosario* are in hand, and when they are finished, the machinery for the new sloop *Vestal* will be commenced. This vessel is to develop 1,400 H.P., and some £15,000 is to be spent upon her propelling machinery. It will be some few weeks into the New Year before the *Rosario's* machinery is finished, and then that of the *Vestal* will be taken in hand.

The "Formidable" and other Launches.

The launch of the *Formidable* at Portsmouth dockyard was very much like any other launch, but one curious fact about it was that in the decorations about the vessel the English flag was everywhere entwined with the American stars and stripes. Mr. Goschen, Sir Michael Hicks-Beach, and many other notables were present, and the *Formidable* was sent on her career by Lady Lucy Hicks-Beach, the wife of the Chancellor of the Exchequer. It will be remembered that Princess May launched the *Prince George* from the same slip about three years ago. Her two sister ships, the *Implacable* and *Irresistible* are as yet unlaunched at Devonport and Chatham respectively, but the latter is to take the water on December 14th. The *Formidable* is an improved *Majestic*, being 10 ft. longer than the present flagship of the Channel Squadron, her dimensions being :—Length, between perpendiculars, 400 ft.; length over all, 430 ft.; beam, 75 ft. The displacement of the *Formidable* is 15,000, with a mean draught of 26 ft. 9 in. The *Formidable's* protective armour is arranged on similar lines to that of the *Canopus*. The side armour of the *Formidable* is thicker than that of the *Canopus*, being 9 in., with a depth of 15 ft., and a length of 216 ft., and it will be treated by the improved Harveyed process. The main armament of the *Formidable* consists of four 12 in. breech-loader wire guns of a new and improved type, mounted in pairs. The auxiliary armament is formed mainly by twelve 6 in. quick-firing guns of a new type—eight on the main deck and four on the upper deck—and sixteen 12-pounders. The estimated speed of the vessel is 18 knots. She is to be propelled by twin screws, each screw being actuated by a set of triple-expansion engines of 7,500 I.H.P. The steam will be supplied by twenty independent water-tube boilers of the Belleville type. The engines and boilers are being manufactured by Earle's Shipbuilding and Engineering Co., Limited. The quantity of coal carried at the above draught is 900 tons, but provision is made for the storage of 2,100 tons. The launch of the *Spartiate* and *Hyacinth* at the end of October, at Pembroke and Glasgow respectively, should also be mentioned. Both these types of vessels have been described in these columns.

Engineering Lessons of the Spanish-American War.

Although it is somewhat late to harp upon the lessons gathered from the recent Spanish-American war, yet a report which has been issued by Chief Engineer Melville, of the U.S. Navy, cannot be passed over in silence, for many of his remarks are very much to the point and deserving of consideration. Incidentally, he remarks upon the absence of casualities in the machinery departments of the vessels in the fighting squadron, even when under forced draught. He thinks, too, that in this department the *personnel* is not equal to the *materiel*, a sentiment which will be echoed by many British Naval engineers. Speaking of the location of the forced-draught blowers, he says that this is a matter of serious importance, and that in some of the American ships, owing to the demands for all other space for other purposes, the blowers had to be located in corners or pockets in the fire rooms, where it was impossible for human beings to give them proper attention, owing to the intense heat due to lack of ventilation. In the *Cincinatti* temperatures as high as 205 degrees Fahrenheit were noted, and the commanding officer, when investigating the case personally, had his face scorched. The blowers, he thinks, should be placed where they can be properly cared for, or else they are useless, and might as well be left on shore. About the torpedo-boats he is very candid, but surely he is somewhat to blame for allowing the state of affairs he speaks of to exist. He says :—"It is greatly to be regretted that the torpedo-boats cannot show the same excellent records for their machinery, but it is a sad fact that nearly every one has had some accident, and the machinery of some at the close of the war was in a condition which can only be described as horrible, where boilers were burnt, cylinder-covers broken, pistons and valves struck, and everything in bad shape. This condition of affairs seems attributable to two causes, the absence of trained engineering supervision, and the use of the boats for duty to which they were not adapted."

The Russian Navy.

The experiments with naphtha fuel in Russian war vessels continues, and a telegram from St Petersburg informs us that the large and powerful ironclad *Rostislav*, which was recently completed at Nicolaieff, and for which engines were constructed at the Baltic Works, St. Petersburg, has just undergone her official trials at Sebastopol. It is noteworthy that the *Rostislav* is the first ironclad in the Russian Navy carrying special furnaces for naphtha fuel, and the trials which have taken place are said to have been very successful, the naphtha furnaces working admirably. The vessel exceeded her contract speed by nearly two knots, running at slightly over eighteen knots during the trial. Considerable activity prevails, too, in the construction department. Two vessels similar in design to the battleship *Osliabaya*, launched at St. Petersburg on the 8th ult., are to be built on the slips vacated by that vessel, and her sister the *Peresviet*, launched last spring from the Baltic works. These vessels will be of 12,674 tons displacement, with a length of 434 ft. and a beam of 71½ ft. The one at the Baltic works has already been begun. Orders have been given to the Nevski building yard for twenty-three torpedo boats of the Sokol type. Five of these are for Port Arthur and Vladivostok. The Russian Naval Reserve Squadron, which leaves Cronstadt to winter for the first time in the open port of Alexandra III. at Libau, consists of the new battleship *Petropavlovsk*, the coast defence armour-clad *Admiral Ushakoff*, the gunboat *Khrabri*, the torpedo cruiser *Abrek*, and the whole of the first equipage of sailors and marines. Four torpedo-boats of the Siberian flotilla are being sent to winter at Port Arthur.

The Dangers of Torpedo-Boat Destroyers.

The result of two serious accidents in torpedo-boat destroyers has been published within the last week or so. Respecting the accident on board the torpedo-boat destroyer *Ariel*, the result has been the death of leading stoker Frederick Fullarger, who was terribly scalded through a boiler being thrown out of place, and who succumbed to his injuries the day after the accident. Two other stokers who were injured have now recovered. In the inquiry which took place at the Gravesend Town Hall, Mr. H. G. Oran, the senior engineer inspector to the Admiralty, said that the damage to the boiler was confined to one tube, which had been blown out of its place, the result being the escape of all the water in the tubes, whence it would have flown into the stokehold through the open furnace door. The original cause of the accident, said he, was the faulty attachment of the tube to the tube-plate. The defects of this particular tube-end, out of nearly 10,000 in the vessel had, unfortunately, escaped notice at the time of construction. After some further evidence, a verdict of "Accidental death" was returned. The result of the accident on board the *Foam* at Malta, the circumstances of which were reported in these columns at the time, has been the awarding to Mr. Richard Wright Toman, the chief engineer of the destroyer, by her Majesty the Queen, of the decoration of the Albert Medal of the Second Class. It will be remembered that Mr. Toman, by his promptitude and pluck, reduced the risk of the ship being sunk, or seriously damaged, and the lives of all on board being probably lost. Torpedo-boat destroyers, which are little more than floating masses of machinery, have, since their adoption, been the continual cause of serious accidents, which is perhaps accounted for by their extreme frailty.

Chatham Dockyard.

Considerable activity prevails at this yard now, and a good many vessels are busy preparing for the pennant. A great many hands are working overtime, the chief engineer's department keeping some 6,000 men busy after working hours. Among the vessels to be prepared for commission are the *Edinburgh* and *Superb*, and the *Warspite* is only waiting for some of her internal fittings before she is ready for sea. The *Cossack* and *Dreadnought*, too, are being pushed on as fast as possible with their re-armaments and refits. A considerable number of torpedo-boat destroyers also had defects to be made good, including the *Angler*, *Ariel*, *Desperate*, *Mallard*, *Swordfish*, *Snapper*, *Sturgeon*, and *Salmon*, and overtime had to be resorted to get them ready to leave here. As regards the *Irresistible*, all the hands which are at work upon her are still working overtime. About 1,500 men are continually at work upon her. She is plated from stem to stern, and when she is launched in the second week of this month about nearly 5,000 tons of material will have been worked into her since she was commenced in April. It is not expected that the *Goliath* will be ready for sea until July next, although she should, according to the intentions of the authorities at Whitehall, have been ready for the pennant in September last, that is, twenty months from the time when she was laid down. Her machinery is somewhat behind hand. If possible, the official steam trials will take place before Christmas. The non-delivery of her bulkhead armour has also hindered her progress considerably. The *Vindictive*, which was built here, was recently

Her submerged torpedo tubes have to be fitted and her guns mounted on board. The machinery trials of the cruiser *Diana* have been reported successful, as have also those of the torpedo-boat destroyer *Haughty*.

To Abolish War.

The American papers have recently been full of a new invention by Mr. Nicola Tesla, of that city, but a native of Eastern Austria, which is to practically do away with war. The following is a description of the invention. It consists of a combination of devices for producing and projecting into the air currents of electricity of enormous voltages, which will extend many miles, also of means of using the waves thus produced for controlling the driving, steering and other machinery of moving bodies on land and sea. If desirable, a vessel carrying great quantities of explosives can be blown up by operators at a far-distant point. Tesla exhibits a working model of a vessel whose every movement is controlled by turning a crank in another part of the room with no connection with the vessel other than atmospheric air. The working of the model proves that there is no operation aboard a great warship in which automatic machines could replace human hands that could not be controlled by the master hand at the tiny crank miles away, with as much certainty and precision as if the hand were aboard the ship. Tesla declares that a single fast unarmoured vessel, without guns, but supplied with a fleet of little vessels, whose movements would be controlled by the operator on board the big vessel, could destroy an enemy's fleet without ever coming within range of any warlike engines used in present warfare. It could also send vast quantities of explosives into a hostile harbour, where the explosion would be almost as destructive as an earthquake. Mr. Tesla is said to have actually applied for a patent. He has worked under Edison, and has had considerable experience as an electrician. The editor of the *Electrical Review* says that it is evident that Mr. Tesla's work has passed the stage of laboratory experiment, and is ready for a practical test on an industrial scale. It will be interesting to learn if the patent is granted, and if it is, when Mr. Tesla proposes commencing his experiments.

Guns v. Armour.

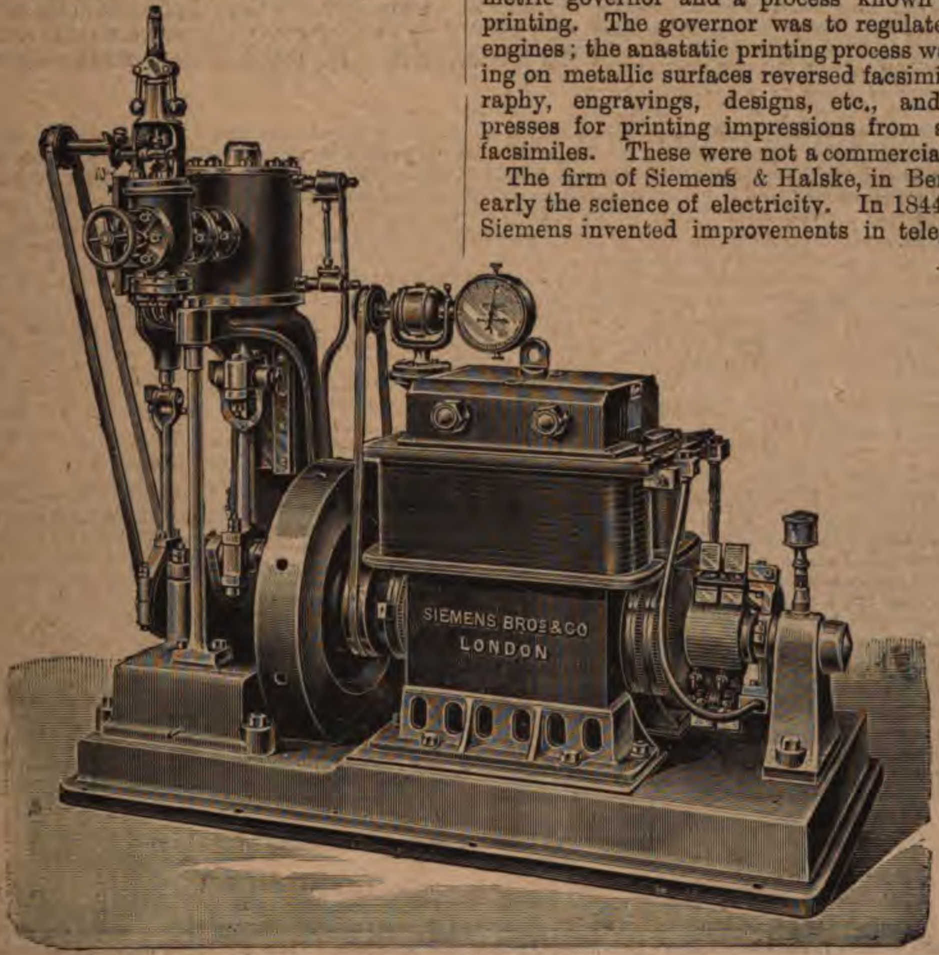
The trials which were recently carried out at Shoeburyness would appear to have amply demonstrated the superiority of armour over guns. But on the other hand experiments have been taking place at Portsmouth with 12 in. wire guns on a new mounting, the results of which, it was anticipated would be to smash the best of the armour plate yet turned out. In the trial at Shoeburyness the dimensions of the plate were 10 ft. by 7 ft. by 11·68 in. thick, backed by 24 in. of oak, and it was attacked by three rounds from the 12 in. breech-loading gun, firing Holtzer armour-piercing projectiles weighing 720 lbs. each, with striking velocities of about 1,860 foot-seconds, the striking energies in all cases being over 17,000 foot-tons, making the total energy delivered on the plate 51,577 foot-tons. The projectiles fired were all completely broken up, and the penetration in every case considerably under 4 in. In another trial against a 9 in. armour plate, manufactured by Messrs. John Brown & Co., the gun used was the 9·2 in. breech-loader, and the weight of the projectile 380 lbs.; but the striking velocity was 1,900 foot-seconds. The indents were only three or four inches, and there were no cracks. The two guns mentioned are among the most powerful in the Navy, and if armour can be made to resist them, the victory in the struggle between guns and armour may be said to rest with the former.

Sheerness Dockyard.

The busiest part of this yard is that where the sloops *Condor* and *Rosario*, and the new cruiser *Pomone* are being built. It will not be long before the *Pomone* carries out her machinery trials. The *Blenheim*, which arrived from China a week or so ago, is to be put out of commission, which may be taken as an indication that the crisis is not at an end, although, on the other hand, the *Sanspareil*, like other port guard ships, has had her complement brought up to her full strength. The *Condor* and *Rosario* will be floated out of dock some time this month, if possible. When completed they will displace some 980 tons, and they are to be fitted with water-tube boilers to give them a speed of 13·25 knots for the *Rosario*, and 12·6 knots for the *Condor*. The refit of the *Champion* has been completed, and she left here some time ago to rejoin the training squadron for the vessels in all. The new torpedo-boat destroyer *Bittern* recently arrived here from Barrow-in-Furness. The torpedo-boat destroyer *Avon* recently passed through all her trials in a highly successful manner.

Pembroke Dockyard.

The royal yacht which is building here is being pushed forward as fast as possible, and as a proof of this it may be mentioned that while there are fourteen gangs of shipwrights at work on her, only eight gangs of shipwrights are at work on the new cruiser *Spartiate*. Hands are being constantly transferred from the cruiser to the yacht. It was originally intended that the latter should be launched in April next. If these efforts continue, it is possible that she will be launched in March. It is expected that the hull, exclusive of fittings, will be practically complete before it leaves the slip. The carvings will be executed at this yard, and although they will be fixed in position for the launch, will be removed immediately afterwards to allow the ship to receive her machinery and to be fitted out. The new armoured cruiser which is to be laid down here shortly has not yet been commenced, and orders have not yet been sent out to the contractors to supply materials for the construction of the hull, but a foundation for the fore part of the keel is being made, and when she is commenced, she will be pushed forward as rapidly as possible. It is expected that the recent visit of the Admiralty will finally result in the erection of a new dry dock here, as well as a new electrical fitting shop, and other subjects which came under consideration were a new pattern and gunnery shop, and the extension of the yard hospital. Of course, such a large undertaking requires some consideration, and therefore it has not been finally settled whether the new dock will be built at all.



COMPLETE P. & O. ELECTRIC LIGHTING SET.—FIG. 1.

MESSRS. SIEMENS BROS. & CO., LIMITED,

QUEEN ANNE'S GATE AND WOOLWICH.

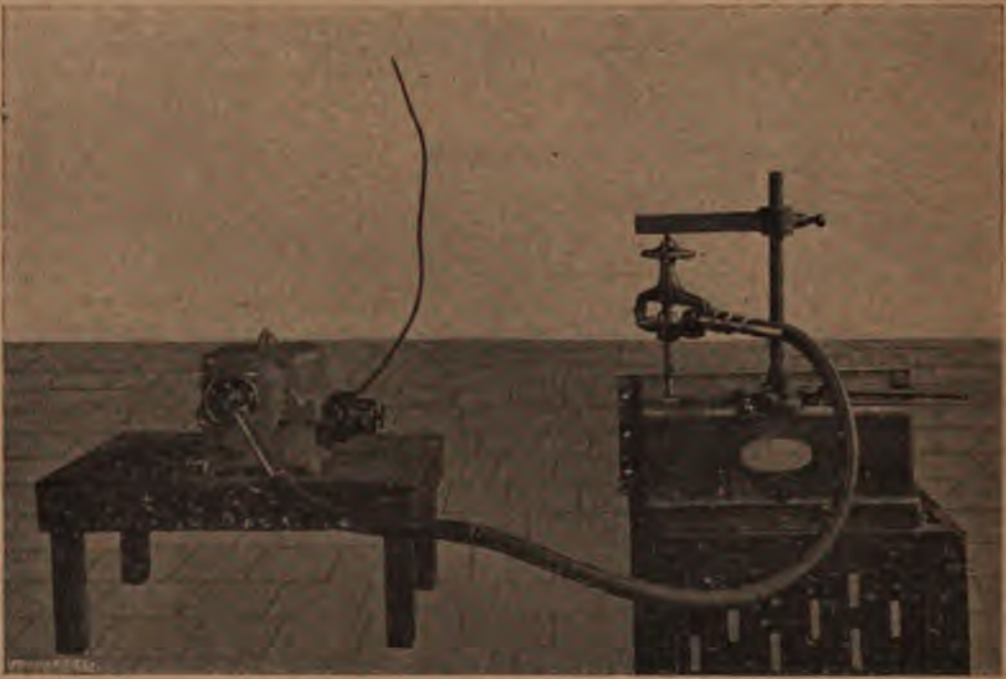
DURING March, 1843, Mr. William Siemens landed in this country in the East End of London. He was 20 years of age, had only a few pounds in his pocket, but brought with him an apparatus or battery for generating electrical currents applicable to the deposition of metals. Messrs. Elkington, of Birmingham, bought it of him and he returned to Germany.

In the following year he returned with a chronometric governor and a process known as anastatic printing. The governor was to regulate the speed of engines; the anastatic printing process was for obtaining on metallic surfaces reversed facsimiles of typography, engravings, designs, etc., and mechanical presses for printing impressions from such reversed facsimiles. These were not a commercial success.

The firm of Siemens & Halske, in Berlin, took up early the science of electricity. In 1844 Mr. Werner Siemens invented improvements in telegraphs. The factory for the manufacture of the patents was started in 1846. In 1848-9 the firm undertook a large contract to make telegraphs from that city to Frankfort and Cologne; and in 1851 they exhibited in London a new system of electric telegraphs, with underground wires and specimens of gutta-percha coated electric line wire, first invented by Mr. Werner Siemens. In 1848 it was decided to manufacture some of the patents in England to save the English import duty. In 1856 Messrs. William and Frederick patented the regenerative furnace. The water-meter, which Mr. William Siemens, with Mr. Joseph Adamson, of Leeds, patented about this time, was a great success. The electric business grew, and in 1858 a factory was established in Millbank Row, Westminster, capable of employing from 80 to 100 men. The manufacture was mainly of telegraph instruments, batteries, etc.

In 1861 Messrs. William and Frederick Siemens patented an improvement in their regenerative furnace by substituting gaseous fuel for solid. The solid fuel was converted into combustible gases in a separate place known as a gas-producer.

In 1863 the factory at Charlton Pier was established. In 1864 Mr. Halske retired from the London firm and it then belonged to the three brothers, Dr. Werner Siemens, of Berlin; Mr. Carl Siemens, of St. Petersburg; and Mr. William Siemens, of London. The Woolwich works now stand in seven and a half acres, and a large area of land in front of the works is being got ready for another addition. As many as 3,000 men have been employed at the present works.



Shop Drill with Motor.—Fig. 2.

At the front of the works are the offices, which are accommodated in a large and extensive building. In this building there is a large museum which contains all manner of instruments and appliances old and new. At the top of the building is a very large drawing office with forty-two tables all engaged.

The first shop entered after leaving the offices was the transference and small machine tools, and above this was the armature building and bobbin-winding place. Here one is struck with the massive size of everything and the ease with which work is accomplished. Along from this floor is a gallery fitted up with milling machines and automatic tools. Along the benches beside the windows, commutator and brush holders are fitted. Below this are the heavy drilling and planing machines. Overhead there *are travelling* cranes worked by electric motors and it is marvellous to see with what ease and without noise the largest forgings and machines are moved about into any desirable place.

There was also about the place a number of independent drilling machines, driven by separate motors, which were very handy. In this shop also were the castings of a large alternator for an electric lighting station. Its capacity was 300 ampères and from 2,000 to 2,200 volts when running at 167 revolutions. From this shop one passes into the dynamo testing room, where there is a staff engaged continually at this work. The room is full of dynamos used in the tests. At the time there were two machines coupled, to be used as equalisers in a three-wire system under test. In the electrical measuring and calibrating department the Admiralty search-lights were mounted and under test. They take carbons one inch diameter. The dynamo erecting shop is a very large one and several sets of dynamos and engines coupled were to be seen here complete. One set for a P. & O. steamship was ready to go aboard. From this shop one is led into the lower floor of another building where switch boards are fitted, and the two upper floors of this same building are used for the construction of instruments. These two upper floors are immense places. Torpedo starters, the construction of which is a secret, and great quantities of telegraph instruments are made in this department. One next enters the pattern, cabinet making and joinery rooms, and beyond these there is the instrument adjusting room and polishing room. Below is the saw mill.

We were next conducted into a quite distinct and separate department, namely the cable shops. The cable begins, gets arranged in strands, goes through many machines in which it is insulated and sheathed. Here it gets a coating of hemp or cotton, next a coating of black insulating liquid material, and several times this is repeated, and finally it is led away through a hole in the wall to the tank-room and coiled inside a large tank, where it is kept under water. As much as 1,500 miles of cable have been made in these shops in one section. The shop containing these tanks is next the river, and the cable is run directly out of the wall and across to the *Faraday* as it lies moored in the stream. Altogether some 25,000 miles of cable has been laid. Adjacent to this is the shop where lead cable is made for street lighting, and in the same place one is astonished to see little bobbins with hemp yarn wound round, moving in a sinuous cam-like groove about a centre. They go near the centre, then out from, as they rotate about a centre, and the notion produces a knitting action on the yarn. The yarn is thus woven about the surface of the wire. The motion of the bobbins is as if they were dancers about a May-pole. One is then shown the smithy, which is used only for light forgings; the repairing shop and the fire-engine station. One fire-engine is entirely electrical. Its cable is arranged so that it may be inserted in sockets arranged for it at many places in the works. Two boilers are of the Babcock & Wilcox type, the others are return-tube cylindrical. The engines and dynamos are direct-coupled; the triple-expansion engines being Williams & Robinson and Bellis's enclosed type.

We illustrate (Fig. 1) a P. & O. electric lighting set, which consists of an engine and dynamo combined. A great number of them have been supplied to this company, and the design and compact nature of these lighting sets are so well known that they need only be referred to.

One particularly good new invention which is being eagerly sought for, is an electric ash hoist. The motor is connected to the winding drum and the hoisting is accomplished with extreme ease. The firm also constructed a six-pole dynamo, which is becoming a great favourite in ship lighting. We also illustrate (Fig. 2) a shop drill with driving motor attached. The drill consists of an ordinary spindle with feeding gear and speed gear, and it can bore holes up to 2¼ in. diameter. The motion is communicated to the spindle of the drill through the speed gear through flexible connection, and it can be taken to any place of the shop to suit the work which is to be drilled. Sometimes the drill is fitted with the nut and spanner arrangement for the feed, at other times it is fitted with a screw and small wheels for the same purpose.

MARINE ENGINEERS' NOTES.

THE scientific paper read before the Institute of Marine Engineers on Monday evening, was on feed-water heaters for steam boilers, the author being Mr. G. Halliday. The main argument on the subject is given in another column, but the paper extended to twelve printed slips, and took just exactly an hour to read. After the argument came the description of feed-water heaters made by different engineering firms. These were illustrated by figures in the paper by lantern slides, and by diagrams on the wall of the lecture room.

The subject of live steam feed-water heaters came in for a large share of the argument since the *rationale* of these has puzzled the engineering world for twelve years or more. To those engineers who are always anxious to solve problems by calculations based on certain assumptions, the matter has been very puzzling since their assumption was that all the heat which came into the feed-water, came out of the steam which heated it.

To other engineers, who depend more on engineering instinct, and who have developed that faculty in a high degree, there has always been an idea that the assumption of all the heat coming out of the steam did not cover the whole question. Indeed the fact that there was increased economy with the live steam heater, proved that there must be some other explanation, and so engineers with engineering instinct beat about as best they could for an explanation, or failing that some word which would come up that they did not know. Our word was "circulation," which happened to be true, but it has no meaning. Another word is "motivity" which has something in it, but that something is only known to its maker, as it is quite new in an engineering sense.

Some engineers deny to this day that there is an advantage by using a live steam heater. Mr. Weir thinks you may as well try to find perpetual motion, and inventors have been trying to do so for a long time with little success. Professor Coterell said it was simply nonsense to talk about the advantage. They were so strong in their assumption that all the heat came out of the steam. Professor Unwin and many others have proved the advantage to be true in fact.

It was left to Mr. Yarrow, of Poplar, and Professor Ser, of Paris, to make the experiments, which when used by the author of Monday's paper placed the solution of the question on a scientific basis. And so the puzzling question of where the heat came from is now solved. One curious thing about the explanation is that Mr. Weir's heater brings more advantage than he himself thought.

Mr. Adamson's paper on the Marine Engineer was to be discussed, but in accordance with his nature he quietly pushed this on one side without anyone noticing it to the advantage of his friend. Mr. Adamson, however, must be happy in the success of his paper, for there have been many conversions to his views. No less a person than Sir E. J. Reid has come to think and say what Mr. Adamson says, and a still greater than he, Rudyard Kipling, has declared, that the quiet, rather pale-faced man of the engine-room is a right good fellow.

Marine engineers who have ear affections will be interested in learning that the Royal Ear Hospital, which occupies an adopted dwelling in Frith Street, Soho, will, by-and-by, be accommodated in a building built suitably for the purpose. Only nine beds are at present provided for the inmates, and there are sixty-eight awaiting admission. It is estimated that the new building will cost £9,000, and towards this £1,000 have been contributed, towards which the Queen has given £25, Lord Dartmouth £100, and Dr. and Mrs. Urban £100.

The *Jilunga* (J. B. Stevenson, chief engineer), transport sailed from Southampton on the morning of the 19th November, with troops for the Mediterranean and elsewhere.

The *Avoca* (W. D. Robertson, chief engineer) transport arrived at Southampton on Saturday, November 19th, from the West Indies, and sails for China with troops on December 1st.

The *Mombasa* (J. A. Baxter, chief engineer) arrived in London early in November from Calcutta, discharged cargo, and proceeded to Middlesboro' to partly load, returning to London to complete, and sails for India on the 29th November.

The *Rewa* (Jas. Girvinch, chief engineer) arrived in London, November 25th, from Calcutta, and sails again for India, December 9th.

The *Duke of Devonshire* (J. Cropley, chief engineer) arrived in London from New Zealand, sailing round Cape Horn on November 16th, and sails again in December for Queensland ports.

NEW MAMMOTH FORGING PRESS AT PARKHEAD FORGE.

ON the occasion of Lloyd's Committee visiting Parkhead Forge and Steel Works recently, a partial demonstration of the capability of the 12,000-ton hydraulic forging press, which is now complete and in working order, was given. Operations were shown on a 25-ton ingot, greatly to the satisfaction and admiration of the visitors. This mammoth hydraulic press dwarfs all the ingenious efforts of the ponderous steam hammer with its violent and gushing exhaust, its sullen and reverberating blows. The slow impact penetrates the heart of the steel, and gives the material a uniform solidity and rigidity unknown in any other process of modern times. The Admiralty have for some years back stipulated that their heavy armour casemated plates must be subjected to a certain amount of hydraulic pressure before rolling to give greater density and ductility to the steel. Ingots to produce the heavier plates weigh 45 tons each.

While laid down with a view to meeting the needs of armour-plate manufacture, the Parkhead press will also be utilised for the making of the largest marine shafts. Many of these at the present time attain the enormous length of 75 ft., and are made from one solid casting of steel, 80 tons in weight, representing a mass of solid metal, 22 ft. in length by 60 in. diameter. To press out this steel block from 22 ft. to 75 ft. of good sound material, free from fracture or the slighest surface defect, the mind can hardly grasp the tremendous force necessary and the great resistive strain to be overcome in the performance of such a feat.

The gigantic press capable of such performances at Parkhead derives its power, in the first place, from five high-pressure water-tube boilers, supplying steam to four pair of horizontal compound hydraulic pumping engines, which occupy a lofty chamber, 48 ft. by 42 ft. The cylinders measure 25 in. and 43 in. respectively with 18 in. stroke. The engines, which were made and fitted up by Messrs. Duncan, Stewart & Co., London Road Iron Works, Glasgow, work under a steam pressure of 120 lbs. per square inch, with 100 revolutions per minute. This combined steam power puts into motion 64 hydraulic pumping rams of Delta metal 1 11-16 in. diameter, and the combined force of these is directed to the main hydraulic cylinder of the press with its piston and pressing face having a resultant pressure of 12,000 tons. This main cylinder, when cast in the Parkhead works, was not less than 64 tons in weight, and when planed down and bored out to 72 in. diameter, with 5 ft. stroke, it weighed 42 tons. It is composed of steel specially alloyed with nickel to secure the maximum of strength. The framework for the cylinder and its adjuncts stands 33 ft. 6 in. high, with 7 ft. cross beam, and 15 ft. wide, composed of 5 in., 6 in., 7 in., and 8 in. thick plates, securely dovetailed and bolted together. Some of these plates weigh, after being machined, no less than 20 tons. To lift the piston and press face, two return rams of 14 in. diameter are required, giving a force of 1,200 lbs. per square inch.

This titanic press is served by a powerful overhead crane, unequalled for strength and capacity, which has been designed and manufactured by the well-known machine tool-makers, Messrs. Thomas Shanks & Co., Johnstone. It runs at a height of 45 ft. on extra strong beams supported by ten massive columns stayed with girders, all built of Parkhead mild steel. It will not only lift and move in any desired direction or position a mass of steel 25 ft. long, 60 in. diameter, and 100 tons in weight, but carry it the full length of its run, 150 ft., covering a span of 65 ft. In the foundations of the press, with its columns, overhead crane, engines and boilers, &c., no fewer than 1,320,000 bricks, and 1,000 tons of concrete, have been absorbed!

It will thus be gathered that the forging press at Parkhead is even a more capable tool than the mammoth presses with which the armour-plate making establishments of Sheffield are equipped. One of the tools of this kind at the Atlas works of Messrs. John Brown & Co., is capable of exerting a pressure of 10,000 tons, and one at the River Don works of Messrs. Vickers, Sons & Maxim has a maximum power of 8,000 tons, while in the Carnegie Works at Homestead, Mass., U.S., there is a press of 11,000 tons capacity.

The inauguration of the 12,000-ton hydraulic forging press at once places Parkhead Works in the position to undertake the very heaviest classes of armour that can be produced, or that may be required for any purpose. Hitherto the armour work at Parkhead has been undertaken by a 4,000-ton press which has been done, and is doing, good work in manipulating the thinner classes of armour required for casemates, conning towers, gun shields, mantlets, etc., up to about 6 in. in thickness. As an instance of the power developed by this capable tool, it may be mentioned that in compressing the ingots for these plates the metal has been reduced at one pressure by 5 in. deep on a length of 6 in. by 9 ft. wide, while in bending the plates to the necessary curvations after they have been rolled in the armour plate mill, its operations are all that can be desired.

The machine shops in the works, fitted as they are with the most magnificent modern tools, have been for a considerable time second to none anywhere. Within the last few months we understand the rolling plant has been largely augmented, and by the addition of a new mill for boiler and ship plates the capacity of this department is now well to the front.

BULL'S METAL AND MELLOID

THE business connected with Bull's Metal, carried on by the Phosphor Bronze Co., Limited, has been recently taken over by the Bull's Metal & Melloid Co., Limited, of 6, Jeffrey's Square, St. Mary Axe, London. We have referred to Bull's metals on previous occasions, but it may be useful to state that these are malleable alloys of great strength, possessing good casting qualities, and equal to good gunmetal in resistance to corrosion. The ultimate tensile strength of the cast metal, for instance, in the form of propeller blades, is about 32 tons per square inch, with an elongation of about 28 per cent. on a 3 in. specimen. It can be wrought hot or cold, as well as cast, and is particularly applicable for propellers, parts of guns and gun carriages, pump rods, centrifugal pump spindles, ram stern shafts, and many other parts of marine and hydraulic machinery. The results of carefully conducted tests, we understand, show a marked advantage of the Bull's metal over cast iron or steel for propellers, a higher speed being obtainable in some cases to the extent of half a knot, and further, the capability of being able to bend the Bull's metal, should the propeller have become deformed by contact with some object, which in the case of iron or steel would no doubt have resulted in the loss of a blade or of the whole propeller.

The catalogue of the company, which lies before us, contains several testimonials to the increases in speed obtained with solid propellers of very unusual sizes and weights, and we have ourselves inspected a series of orders on the books of the company for such solid propellers of about 17 ft.

large cargo boats. We are not aware that solid propellers in a bronze alloy have ever previously been produced of such sizes and weight.

The company are also selling a bronze under the title of "Melloid." This alloy is a genuine copper-tin alloy, containing no inferior metal. Its resistance to corrosion is great. Its tensile strength in a rolled or drawn state when suitably finished is as high as that of mild steel, and is not appreciably affected at the temperature of high-pressure steam, although copper at such heat is very much reduced in strength and elasticity. "Melloid" is therefore an excellent substitute for naval brass, yellow or Muntz metal and manganese bronze, and also for wrought copper, wherever a combination of toughness, great strength, a maximum resistance to corrosion and mechanical resistance is required. "Melloid" tubes, we understand, have been and are being successfully used in connection with water-tube boilers of several types. The metal is tough and malleable at all temperatures up to a bright red heat, and has no brittle stage at a black heat like steel and most bronze and brass alloys; this in connection with the peculiarity of being stronger and tougher at a red heat than mild steel, should make it particularly valuable as a material for boiler tubes. Condenser tubes of this metal are being supplied to the British Admiralty and Mercantile Marine. Although the price per lineal foot is slightly higher than that of brass, much thinner gauges can be used with safety, which means reduction in weight, increase of condensing surface, and efficiency and a longer life of tubes on account of great resistance to corrosion. For example, in replacing brass tubes of ¾ in. outside diameter by 16 wire gauge with such in "Melloid" of 19 wire gauge, the saving in weight is about 25 per cent., and an increase of internal surface of about 7½ per cent.

These special features gives such tubes a long lead over brass tubes.

THE INSTITUTION OF MARINE ENGINEERS.

THE FIRST DECADE—PAST PRESIDENTS.

(*Continued from page* 276.)

SIR EDWYN SANDYS DAWES.—In almost all of his strong biographical sketches Carlyle traces the influence of forefathers on the character of his heroes. He traces the lineage of Oliver Cromwell, and informs us of his relationship to Thomas Cromwell, the maker of the despotism of Henry VIII. He traces the influence of the father on the character of the Great Frederick, of Luther, of Mirabeau and of Burns, and indeed proves to us quite clearly the effect which the character of the father has on the son.

If ever there was a case in which the essential even tenor of great characteristics were preserved through generations it is shown in those of Sir Edwyn Sandys Dawes. The family contains the name of Mrs. Sherwood, Sir Edwyn's grandmother, the authoress at the beginning of this century of the beautifully pious books, the popularity of which causes them and their numerous editions to cover fifteen printed columns of the catalogue of the British Museum reading-room. The Archbishopric of York contains the names of Sir Wm. Dawes and Edwyn Sandys, and Sir Edwyn's father, the Rev. C. T. Dawes, of Boughton, in Kent, is vicar of Dilhorne, in Staffordshire. A strain of modest reverence for all that is best runs through the whole family, and so we have Sir Edwyn saying, "Any success which has attended my life or of that of the firm, I gratefully attribute to the genius and enterprise of my old chief, Sir Wm. Mackinnon, whose great services in the interests of commerce and humanity, and in opening up dark regions of the globe formerly the haunts of the pirate and the slave dealer, are so well known to his countrymen."

The family is an old one, and can be traced back for centuries, and some of the land owned by Sir Edwyn at the present time has been for centuries in the possession of the family. Mount Ephraim, where Sir Edwyn now resides, which is surrounded by his model farms, was built by Major W. Dawes in the 17th century. During the time of the Stuarts the landlords of the family were farmers of the customs. Not only have Sir Edwyn's family held leading positions in the church but foremost places have been filled by them in the army. It was a major who built Mount Ephraim and in these later days Sir Edwyn's only brother, Colonel Bethel Dawes, was on Lord Wolseley's staff in his first Egyptian expedition. Sir Edwyn holds the Portueguese Order of the Immaculate Conception.

Sir Edwyn was born in the January of 1838, and was educated at King Edward's Grammar School, in Birmingham. Like all English boys he had an early passion for the sea, and was anxious to enter the Navy, but his parents were unwilling that he should do so, and his entrance was put off until he was too old. His wish, however, to rein the "white horses" did not die out as he grew, and indeed he was but one of Kipling's English boys—

"By day with stamping coursers,
By night in whinnying droves,
Creep up the wild, white horses
To call them from their loves.

And come they for your calling?
No wit of man may save;
They hear the wild, white horses
Above their father's grave.
And kin of those we crippled,
And sons of those we slew,
Spur down the wild, white riders
To lash the herds anew."

At last his parents permitted him to join the service of the Peninsular and Oriental Co. in the August of 1854. His ship, the *Nubia*, was employed throughout the Crimean War in carrying troops and horses from Marseilles, Genoa, and the Turkish ports to Balaclava and Kameish Bay, and conveying the sick and wounded to Scutari, and Sir Edwyn, with the ship, was present at the capture and burning of Kertch. At the beginning of the year 1856 the *Nubia* was sent to Calcutta, and the boy, being adventurous and wishing to see more of the world, joined the sailing ship *Antarctic* as third officer. On the second voyage the ship was wrecked in the Straits of Malacca. For five days Sir Edwyn, with the crew was cast about in an open boat until they were picked up by the barque *Bengal* and taken to Singapore, where he joined the Peninsular and Oriental Co.

In 1860 Sir Edwyn terminated his engagement as a ship's officer, and joined the office staff of the Peninsular and Oriental Co. In 1862 he took charge of the British India Steam Navigation Co.'s branch in Bombay, then under the control of Messrs. W. Nicol & Co.

Three years after, in 1865, when Sir Edwyn was only 27 years of age, he returned to England, and, with Mr. Archibald Gray, a nephew of Sir W. Mackinnon, established the firm of Gray, Dawes & Co. The following year Sir Edwyn went out to Persia and established branches of his firm at Baghdad, Bassorah and Bushire. The land there is poor, the trade is now dull, and the Germans, with the cognisance of the British Government, are establishing trade centres in the district. A railway has been talked of as an overland route to India, but the district is unbearably hot.

In 1872 the firm opened another branch at Zanzibar, which was the beginning of the formation of British East Africa, for a little later, acting for Sir Wm. Mackinnon, concessions of territory were obtained between Mombassa and Uganda. A large amount of money was spent upon the undertaking, and when it was taken over by the British Government Sir William and his friends were but indifferently treated. British East Africa, which is six times the size of Great Britain, is now a part of the colonial possessions of the British Empire.

In 1882 the operations of the firm were extended to Queensland, and the colony is not ungrateful or unmindful of Sir Edwyn's help to them, because when other sources failed he tided them over some serious financial difficulties.

Since 1856, when the British India Co. was created, it has gone on with a steady, unostentatious progress until now it has become one of the largest shipping undertakings in the world. Its special usefulness has been in establishing steam communication in waters where none previously existed; and its ships in various emergencies have been made use of by the Indian and Imperial Governments at short notice for transporting troops.

Sir Edwyn is chairman of the New Zealand Steamship Co., the Queensland National Bank, the British India Associated Steamers, the Australian United S.N. Co., and director of the B.I.S.N. Co., Suez Canal, Euphrates and Tigris S.N. Co., &c. This, one would think, was sufficient to exhaust the energies of anyone, but no, in his estate of 2,000 acres he takes an interest as he would if it were his only charge. The simple letters about details of seeds to be used, and crops which he receives from his bailiffs, are read and considered by him with the attention he would devote to the weightiest document from a great African dependency. Perhaps he has feelings like the great Sir Walter, when he made his last journey to Abbotsford. The vine-clad slopes and the blue skies of Italy could not affect him, only the barren hills of Eildon could bring tears to his eyes when he came home to die. Mount Ephraim is Sir Edwyn's home, and has been long the home of his fathers, and he is one of the landed gentry who are the English.

Sir Edwyn is not possessed of that which is known in the city as "side." We would take him, even with all his greatness in business, to be one whose face and bearing would invite the weak to tell him their story with the sure knowledge they would be heard.

MARINE ENGINEERING PRACTICE.

At a meeting of the Manchester Association of Students in connection with the Institution of Civil Engineers, held on Nov. 23rd, Mr. F. T. Wolseley-Lewis read a paper entitled "Notes on Marine Engineering." The propulsion of boats and ships had, he said, passed from prehistoric times through the stages of oars and sails, to be superseded in 1802 by steam. The types of engines for paddle-boats had developed from the side lever, trunk, oscillating and horizontal engine, to the inclined form now chiefly used. The engines for screw propulsion of the horizontal and inclined type, followed by the return connecting-rod engine, had now been entirely superseded by the vertical engine. The degree of compounding of engines depended on the effective pressure between the boiler and condenser. Where the boiler pressure equalled 150 lbs. per square inch, and there was the necessary length of bed-plate, the triple or quadruple four-crank engine was the best. Steam jackets to cylinders were theoretically of great use, but in actual practice in marine engines there were many disadvantages attending their application. Super-heating gave the same effect, but to greater advantage, whilst it also utilised the surplus furnace heat. The degree of super-heat required was lower in fast than in slow engines, and to be economical should only be such as to prevent condensation in all the cylinders. The types of boiler generally used were the marine, locomotive, and water-tube. The former was strong and serviceable for low pressures and ordinary usage. The locomotive form was useful in torpedo-boats, but the water-tube was the best for fast ships, and especially in the Navy. Of the latter class those with small tubes, natural circulation, and of the cascade type, were preferable. Forced draught made a boiler capable of doing more work. The systems in use were (1) the closed stokehold; (2) forced draught taken through tubes to the boiler; (3) draught induced in the chimney. Howden's system of the second type gave the best results. Economy of fuel was of the greatest importance, and to this end complete combustion of the gases was necessary, and might be better ensured by regulating the air blast, whilst if a combustion gauge were used, it would indicate the percentage of carbon-dioxide in the fuel gases. Many advances could also be made with respect to economies in weight, space occupied, and cost of machinery. Electricity lent itself to many economies, not only as regards propulsion, but in loading and other auxiliary purposes. Turbines might be used for driving dynamos. By the application of this means of power the weights of machinery would be better distributed, the centre of gravity lowered, and the cross section of the ship reduced, with a consequent increase in speed.

Catalogue.—Messrs. Alley & MacLellan, of the Sentinel Works, Glasgow, whose specialities are suction and sea chests and marine valves and fittings, have just printed a new and very interesting catalogue. Excellent illustrations of a great number of appliances of the character referred to are afforded. But we also find towards the end of the book that this firm go in for somewhat more elaborate machinery than mere fittings, however carefully designed and executed they may be. They are patentees of a Sentinel steam steering gear of which nearly a thousand sets have been supplied, and also of capstans, feed-water heaters, ash-hoisting engines, and of an auxiliary engine and dynamo for use in the electric light installation on shipboard. Each of these bears in the same way the distinguishing name of their works. The system which they suggest to their customers is a good one. They offer to supply the smaller parts of engines to specification and to required date, and undertake to fit them to and test them on the main machinery for which they are designed. Besides the information which is peculiar to the firm and its work there are many tables of weights and measures and of other information which engineers and business men will find convenient to have on their desks.

A CENTURY-OLD BOULTON AND WATT ENGINE.

Dundee possesses an interesting and well-preserved example of a Boulton and Watt beam condensing engine, having the sun and planet wheel motion, which device, as is so well-known, Watt adopted for the conversion of reciprocating into rotary motion after having been forestalled by Wansborough in the matter of patenting the crank. The engine has been at work until lately within Douglas Bleachfield, some three miles from Dundee, but recently through a combination of unfortunate circumstances, the Bleachfield has been closed, and a displenishing sale of the machinery and plant taken place. The idea, however of securing this precious relic of bygone engineering for the Dundee Museum has for several years been kept in view by a number of gentlemen interested, and on observing that the engine was not mentioned in the catalogue of articles for sale, they set about ascertaining the intentions of the owners of the property with regard to it. It was then learned that negotiations had been taking place between the owners and a well-known American millionaire engineer, and that there was a probability of the engine finding its way to the United States at a high price. The owners have expressed themselves as being anxious that the engine should be retained in Dundee, and made certain advantageous proposals for its purchase. The necessary funds have now been raised, and the purchase has been effected, with the result that the engine will find a safe asylum in the Dundee Museum. The engine is believed, by those well informed in such matters, to be one of the best examples of Watt's earlier work, scarcely inferior indeed to the one in the British Museum. After having worked for a considerable time at Newcastle this engine was bought second-hand, and brought to Scotland in the year 1797, over one hundred years ago. It is rated at 20 H.P., the steam cylinder being 20 in. diameter, and the length of stroke 48 in.

ELECTRICAL NOTES.

(From our own Correspondent.)

Largest Searchlight in the World.—During the American war with Spain, searchlights played a most important part in the blockade of the Cuban coast. All night long the lights from the American Fleet played on the entrance to the bay and it was due to their service that Admiral Cerveva was at last discovered stealing out. It will be interesting to marine engineers to learn what can be done in this direction. There has been erected a great searchlight at the summit of Mount Lowe, in California, and it is under atmospheric conditions which are likely to show what are the possibilities of such an instrument. It is mounted on a wooden base, and the light itself stands 11 ft. high, its weight is 6,000 pounds, and it is so balanced that a child can easily move it in any direction. The reflecting lens is 3¼ in. thick at the edges, and 1-16th in. thick at the centre, and it weighs 800 lbs. The metal ring in which the lens is mounted, weighs 750 lbs. the total weight of lens, ring and cover being about 1,600 lbs. The candle-power is 3,000,000 and the diameter of the lens about 8 ft.

Electrical Motors on Warships.—Captain Charles O'Neill, chief of the Bureau of Ordnance of the Navy Department of the United States reports: "Experience has shown that guns in turrets operated by electric power can be laid upon more accurately, and made to follow a moving target than when operated by steam, hydraulic, or pneumatic power. There are no water pipes to freeze, no steam pipes to burst, and no delay in obtaining a full working pressure, and no troublesome or exhaust pipes to deal with. A burned-out fuse can be replaced quickly, or a broken wire repaired, and as the wires can be laid below the armoured deck, there is little liability of the latter becoming necessary." The line officers of the Navy are in favour of it for the above reasons. The engineers are in favour of it because it is much easier to operate and repair than a hydraulic or pneumatic system. During the recent operations under Admiral Sampson, several accidents to hydraulic apparatus occurred, and the electrical fittings used for the same purpose was favourably commented on by the officers. It is highly probable that complete electrical fittings will be made in the new warships to be built for the United States Navy.

Telephonic Line along the Shores of the Mediterranean.—It will be a great convenience to maritime people when this line between the towns on the shores of the Mediterranean and Marseilles has been established, and as they will be in communication with Marseilles it means that they will be so with Paris and then with London. Last April a conference was held between the representatives of the various towns and M. Fronin, Chief of the Bureau of Telegraphic Correspondence to the Ministry. It was resolved to raise a loan of 350,000 francs at 3·60 per cent., payable at the expiration of five years, the sum being guaranteed by the towns interested. The interest to be paid by the towns would be 12,600 francs, and these have been proportioned for the several towns, Nice being set down for 2,000 francs, Marseilles 2,000, Toulon 8,000, Monaco 3,000, etc.

Commutator Lubrication.—M. H. Bartels uses a compound for the lubrication of commutators, for which he claims that the brushes may be maintained stationary whilst the load of a dynamo is varied without any production of sparks. Finely-powdered graphite is one of the ingredients of the compound, and it produces on the brushes and commutators very highly-polished surfaces.

The "Daily Mail" again.—Lately we called attention to the nonsense which was being published by the *Daily Mail* on marine engineering matters. It will be remembered that the world was informed through the *Daily Mail* that Messrs. Yarrow were fitting Parson's steam turbines into their destroyers, and there was not a word of truth in the statement. Now they are going it very strong on M. Tesla's discoveries in electrical matters. Here is a bit:—" A French fleet is to be cruising about off some coast. M. Tesla is to be sitting comfortably in his room, presently he will touch a button, and a few minutes after the people on the shore watching the fleet will wonder where it has gone to." Another is this:—" The waters of Niagara or some other big fall will be sent through wheels and current generated at enormous voltage. This will go up very high in the atmosphere by the string of a balloon. Another balloon will be sent up from a town which wants the current, and it will suck it down its string to the said town. Hence great saving of copper." Here is one better:—" The Wilson Line will take over one of the continental falls, generate electricity, and send it up in a balloon. Another balloon will be carried by the ship and take down the electricity to the motor which drives the screw-propeller." In all soberness this is what M. Tesla claims:—1. The method of transmitting electrical energy herein described, which consists in producing at a given point a very high electrical pressure, conducting the current caused thereby to the earth, and to a terminal at an elevation at which the atmosphere serves as a conductor therefore, and collecting the current by a second elevated terminal at a distance from the first as set forth. 2. A system for the transmission of electrical energy comprising in combination a source of current of very high pressure, connected respectively with the earth and with a terminal at an elevation where the atmosphere forms a conducting path for the current produced, a second elevated terminal at a distance from the first for receiving the current transmitted therefrom, and means for utilising the said current as set forth.

A Submarine Arc Lamp.—Messrs. J. E. Burdich and F. G. Hall, jun., in Yale University, have invented an air-tight arc lamp for submarine work, and it has been successfully used in the Brooklyn naval yard. The United States Government employed the inventor to lay electrical mines in certain harbours on the main coast, and it was there they began to consider how they might apply the arc lamp under water. The lamp used is enclosed, the outer globe fitting to the case above it with an air and water-tight joint, and guard rods protect the outer globe. Most of the tests made at Brooklyn yard were at a depth of 25 ft., but the lamp can be made to stand the pressure at any depth. It is of 2,000 c.p., and will be of great use in submarine photography.

Electrical Power on Monitors.—The four new monitors to be constructed for the United States are to be fully equipped with auxiliary apparatus, electric motors being installed for the turret turning gear, ammunition hoists, and ventilating apparatus.

The Lucigraph.—Mr. John W. Haywood of St. John's, Newfoundland, has invented an apparatus whereby the letters of the international maritime code may be thrown on a suitable background such as a funnel or cloud. Its principle is the same as the magic lantern, but a more powerful light is made use of in it. It is fitted with a four-inch condenser and a two-inch lens. Between the two on the side are located a number of movable stencil plates cut to represent the letters of the alphabet and numerals from 1 to 9. Along the top of the apparatus is a key board with a double row of keys like a typewriter. Touching a key brings the stencil plate to the letter it represents between the condensers and the light, its outline being projected on the object in the path of the light rays. Stretched sheet or board would draw the fire of the enemy. It is thought a 1,000 candle-power light will throw a ten-foot letter a distance of two miles. On October 12th a trial was made of it on the North German Lloyd steamer, *Hoboken*, when letters of ten feet in height were thrown on a canvas and were readily made out.

Portable Electric Safety Lamp.—This is mainly intended for miners, but it would be suitable for marine engineers while inspecting the tunnel shaft and generally down below. It consists of a dry battery arranged to be carried in a holder at the belt or in the pocket. This is controlled by a rheostat allowing the lamp to turn at the same rate during the life of the battery. The lamp is of six candle-power, is set in a small white enamelled parabolic reflector provided with a stick pin to attach it to the hat. The light is strong enough to read by at a distance of 100 ft. from the lamp. It has been found useful by gas inspectors in reading meters; by repair men exploring cellars and trenches for gas leaks; by miners in gaseous mines; by workmen repairing oil and gas tanks.

United States Mechanical Stoker.—It consists of the usual hopper with feeding mechanism, which however is driven independently by a small steam motor immediately in front and beneath the hopper. This motor has a small reciprocating piston. Its piston rod carries a cross head which, by means of suitable connecting links, operates a rocker having a ratchet mechanism which turns the rachet wheel attached to the conveyor shaft. It is entirely self-contained, and there is no danger of the working parts getting out of trim. The rate of feeding is controlled by the speed of the motor which again is affected by the simple means of throttling the steam in the supply pipe to the motor.

Manila and the Philippines.—The United States will not be content till they obtain possession of the Philippines, and it is interesting to know that several of the places to which they fall heirs are in a high state of development. Honolulu, the capital of Hawaii, is a city of 30,000 inhabitants, and is lighted with the electric light, and it has a complete telephone system. The city of Manila is lighted by electricity and has a telephone system. There are about 720 miles of telegraph in these islands. A cable connects Manila with Hong Kong, and another runs from Manila to the Vicayas Islands, and another to Cape Bolinao.

Large Installation of Babcock & Wilcox Boilers.

We are in receipt of an illustration of the new electrical power house which is being fitted with engines, dynamos, and boilers for the central station of the Metropolitan Street Railway Co., New York. The horse traction is to be replaced by the electric conduit system. The station is at the extreme east side of the city, between Ninety-fifth and Ninety-sixth streets and between the First Avenue and the East River. The alternating current system has been adopted. The station when completed will contain engines and generators of about 70,000 H.P., and the Babcock & Wilcox boilers are to supply the steam. The building will occupy a space of about 201 ft. by 279 ft. The surface of the site will be covered by piling, about 8,000 piles being used, and on these piles will be a layer of concrete four feet thick with an additional foot of thickness under the coal storage columns.

The engine-room will be 100 ft. wide by 200 ft. in length on the short side. It will contain 11 vertical cross-compound side crank condensing engines, each direct connected to an alternating current generator placed between the two columns of the engine. The engines will be 4,000 N.H.P., but they will have a maximum capacity of 6,600 H.P. The generators will supply current at 6,000 volts, which will be reduced at sub-station to 550 volts by means of static transformers and rotary convertors and then supplied to the conductors in the conduit. The boiler room will contain 87 water-tube boilers rated at 250 H.P. each, with a capacity of 400 H.P. The boilers will be arranged in three floors, each floor 82 ft. wide by 240 ft. long. The boilers are set in batteries of two with 5 ft. passages between. The smoke stack is 350 ft. high, and 22 ft. in diameter. Over the boiler room is the coal storage bin with a capacity for 9,000 tons.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from October 26th to November 25th, 1898 :—

Backler, Leonard, engineer to the *Buzzard*, in lieu of a chief engineer, to date November 29th.

Barter, Frederick, engineer to the *Devastation*, to date November 8th.

Basson, Harry, chief engineer to the *Vivid*, for the *Seal*, to date November 3rd.

Batey, Harry, artificer engineer to the *Vivid* (supernumerary), to date November 1st.

Bedbrook, James A., chief inspector of machinery to the *President*, additional, to date November 14th.

Bell, John F. (probationary), assistant engineer to the *Trafalgar*, to date October 29th.

Blake, Francis G., artificer engineer to the *Vivid* (supernumerary), to date November 1st.

Bloor, Henry, artificer engineer to the *Vivid* (supernumerary), to date November 1st.

Bolton, A. W., engineer to the *Victory*, for the *Violet*, to date November 22nd.

Brown, Arthur, assistant engineer to the *Philomel*, to date October 1st.

Bryer, Sydney, M. G., assistant engineer to the *Niobe*, undated.

Bush, Charles A., artificer engineer to the *Pembroke* (supernumerary), to date November 1st.

Canning Henry S., assistant engineer to the *Pembroke*, for the *Pactolus*, to date November 21st.

Canter, W. J., inspector of machinery to the *Vivid*, for the *Reserve*, to date January 1st.

Cock, Alfred F., assistant engineer to the *Alexandra*, to date October 29th.

Cockey, George H., engineer to the *Centurion*, to date November 5th.

Cocks, Frederick A., fleet engineer to the *Vivid*, for the *Blake*, undated.

Coleman, Arthur W., assistant engineer to the *Sanspareil*, to date October 29th.

Coomber, Thomas O. (probationary), assistant engineer to the *Thunderer*, to date October 29th.

Coulter, A. P., has been appointed assistant engineer R.N.R.

Cox, Albert E., chief engineer to the *Pembroke*, for the *Cynthia*, to date November 11th.

Currie, James, artificer engineer to the *Victory* (supernumerary), to date November 1st.

Dalrymple, John H., chief engineer to the *Vivid*, for the *Blonde*, to date November 23rd.

Dalton, William, artificer engineer to the *Victory* (supernumerary), to date November 1st.

Davidson, George, artificer engineer to the *Victory* (supernumerary), to date November 1st.

Davies, Robert B. (probationary), assistant engineer to the *Thunderer*, to date October 29th.

Davis, Frank, artificer engineer to the *Victory* (supernumerary), to date November 1st.

Dupen, Arthur P. L., engineer to the *Brisk*, to date November 10th.

Edgar, Edward J., chief engineer to the *Brisk*, to date November 10th.

Edmonds, J. C., staff engineer, has been allowed to assume the rank of fleet engineer on the retired list.

Evans, Allan (probationary), assistant engineer to the *Howe*, to date October 29th.

Evans, Alfred, assistant engineer to the *Gleaner*, to date November 8th.

Fedarb, W. (b), staff engineer, has been allowed to assume the rank of fleet engineer on the retired list.

Follett, Samuel G., fleet engineer to the *Devastation*, to date November 8th.

Freeman, Benson F. (probationary), assistant engineer to the *Nile*, to date October 29th.

Frowd, William S., chief engineer to the *Victory*, for the *Flying Fish*, to date November 3rd.

Gallery, Edward, chief engineer to the *Pembroke*, for the *Northumberland*, to date November 8th.

Gibson-Sugars, John S., chief engineer to the *Wildfire*, for the *Desperate*, to date November 3rd.

Goodall, George T., engineer to the *Victory*, for the *Hardy*, to date November 22nd.

Goodwin, Frank R., assistant engineer to the *Terrible* (temporary), to date November 22nd.

Gordon, Francis A., engineer to the *Vivid*, additional, to date November 5th.

Grant, Henry W., assistant engineer to the *Howe*, to date November 21st.

Gregory, Peter E., artificer engineer to the *Victory* (supernumerary), to date November 1st.

Ham, Septimus, engineer to the *Vivid*, for the *Bat*, to date November 15th.

Hamblin, Francis W. (probationary), assistant engineer to the *Niobe*, undated.

Hall, Arthur C., assistant engineer to the *Australia*, to date October 29th.

Harding C. A., chief engineer, has been advanced to the rank of staff engineer, in H.M.'s fleet.

Hare, John, S., assistant engineer to the *Pembroke*, for the *Pegasus*, to date November 21st.

Harrison, Jesse H. (probationary), assistant engineer to the *Rodney*, to date October 29th.

Hart, Alfred, chief engineer to the *Pembroke*, additional, for gun and torpedo boats, to date October 29th.

Hender, William J., chief engineer to the *Victory*, for the *Bellona*, to date November 11th.

Hender, W. J., chief engineer to the *Victory*, for the *Seagull*, to date November 11th.

Herbert, Robert K., chief engineer to the *Gleaner*, to date November 8th.

Hindmarsh, John, artificer engineer to the *Victory* (supernumerary), to date November 1st.

Hockey, Stephen, staff engineer to the *Pembroke*, for Chatham Dockyard reserve, to date October 29th.

Hughes, C. R., has been appointed assistant engineer, R.N.R.

Jackson, Thomas P., engineer to the *Pembroke*, for the *Argonaut*, to date November 23rd.

Jackson, Laurence, artificer engineer (supernumerary) to the *Victory*, to date November 1st.

James, Charles J., chief engineer to the *Proserpine*, to date November 8th.

Johns, Arthur J., staff engineer to the *Niobe*, undated.

Johnson, Malcolm C., assistant engineer to the *Devastation*, to date November 8th.

Jury, Richard R., assistant engineer (temporary) to the *Niobe*, undated.

Killick, Thomas, artificer engineer (supernumerary) to the *Vivid*, to date November 1st.

Kingston, Robert W., artificer engineer to the *Victory* (supernumerary), to date November 1st.

Liversedge, Henry T., chief engineer to the *Severn* for the *Circe*.

Ludgate, W. G., engineer to the *Pembroke*, for the *Cynthia*, to date November 11th.

Lumsden, W. G. G. P. (probationary), assistant engineer to the *Victory*, for the *Europa*, to date November 22nd.

Magrath, Francis, assistant engineer to the *Pembroke*, for the *Perseus*, to date November 24th.

Marshall, William E., artificer engineer to the *Pembroke* (supernumerary), to date November 1st.

McCarthy J., fleet engineer, has been placed on the retired list, in accordance with the provisions of her Majesty's Orders in Council of February 22nd, 1870; April 30th, 1877; and February 26th, 1897.

McFarlane, David E., artificer engineer to the *Vivid* (supernumerary), to date November 1st.

Messervy, Chas. de F., assistant engineer to the *Colossus*, to date October 29th.

Moffett, E. G. P., staff engineer to the *Champion*, to date November 16th.

Mogg, W. G., chief engineer, has been advanced to the rank of staff engineer in H.M.'s fleet.

Moroom, Wm. C., engineer to the *Pembroke*, for the *Contest*, to date November 5th.

Nichols, H. D., artificer engineer to the *Vivid* (supernumerary), to date November 1st.

Nuthall, Francis D., artificer engineer to the *Victory* (supernumerary), to date November 1st.

Weeks, Geo. H., inspector of machinery to the *Wildfire*, additional to date October 1st, and to the Medway Reserve to date November 1st.

Woodhouse, G. W., probationary assistant engineer to the *Magnificent*, to date October 4th.

Reviews.

The Royal Navy List Diary and Naval Handbook for 1899. London: Witherby & Co., 1898.

The second edition of this useful publication contains several new features and improvements on its predecessor. The diary proper shows a separate page for the entries of each day in the year. A special addition has now been introduced by which another page is added at the end of each month, quarter and half year on which can be entered the dates upon which certain drills have taken place, whilst provision is also made for summarising up the year's work in this direction. Mr. Laughton Carr gives a brief summary, in continuation of that afforded in the first issue, of the naval progress of the year. There is an obituary of Naval men for the period just passed, and in it their war and other meritorious services are shown. Another new feature which will attract the attention of all interested in the Navy, whether they be service men or not, is the detailed list of the benevolent funds and institutions connected with the Navy, together with a brief statement of the objects for which they were founded. The work seems accurate and will be a very useful companion to the same publishers' Navy list, which is now indispensible to naval men and to those who wish to have fresh and accurate knowledge of the *personel* of our first line of defence.

The Torpedo in Peace and War. By Fred T. Jane. London: W. Thacker & Co., 1898.

Mr. Jane is a well-known naval correspondent. He has been afloat in our manœuvres and is what is nowadays known as a "Naval Expert." The volume before us covers a good deal more ground than the title suggests. For nothing in that title would cover the inclusion of a ram attack by a trireme, and there is nothing either in history (or in the book) to suggest that triremes included torpedoes in their armament. Mr. Jane—like, we fear, many writers for the daily Press—is a little given to inelegant writing, trusting, we suppose, to the severe editing and press reading which prevails in London newspaper offices. Thus at page 19 we read—"The cost of a torpedo is from £500 to £600. British ones are manufactured at Woolwich." The formation of this expression, though it states an incontrovertible fact, needs no comment. Again at page 67 there is a comparison of the engines of the torpedo-boat destroyer *Dragon* and those of the old armoured cruiser *Northampton.* In this certain statements are made which are certainly true, but they somehow convey altogether a wrong impression. It is absurd to compare the rate of revolution of the engines of a little destroyer with those of a seagoing ironclad. Small engines can and must run faster than larger machinery. Large engines are put into ships which must be designed for possible running for weeks together. Little ships, like destroyers, would be limited by many considerations (which we need not here enumerate) to spurts of but a very few hours together. Mr. Jane's facts are accurate, but his deductions are simply amusing. Amusement indeed will be derived from the whole volume. The pictures of the discomfort of small craft at sea and of the good humour with which naval men put up with trying circumstances, when their duty involves it, are interesting and instructive to those who have either never been afloat or have only seen the face of Neptune from large merchant ships. Nevertheless an immense amount of up-to-date information as to the development of the modern destroyer and first-class torpedo boat has been accumulated here for our instruction, and has been set out in a form which neither bores us with its over-statistical aspect nor enrages us by too palpably showing that the author has "written down" to us. We see in every page that Mr. Jane is a good fellow, and that he makes the best of any predicament he may be in, and further that he is desirious of giving those who have not had his opportunities a chance of seeing things as he has seen them. He absolutely and perfectly fulfils his intention. His eye for detail is keen indeed, and he obviously has either a remarkably good memory or a very good note-book. Perhaps both. He sees more than most people could observe, and he fails to note nothing that comes within his range. He knows, too, from long experience how to winnow the chaff, with which naval men beguile the tedium of trying times, from the wheat of solid fact. We have had reason to call attention to one or two minor defects in the book, but they are of the kind which are entirely of a piece with its best qualities. As a description of naval life as it is at this time we can cordially recommend it. It is a very faithful and true impressionist picture.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent

THE output of new tonnage during October brought the total for the 10 months of the year up to about 342,000 tons, and the output for the portion of November which has already passed has been such as to make it all but certain that the year 1898 will prove the record year for tonnage output in the history of the shipbuilding industry on the Clyde. A large proportion of the output during the past three months has consisted of vessels of considerable tonnage, and, with the exception of the *Hyacinth*, second-class cruiser, of 5,600 tons, all these vessels have been screw steamers for the mercantile marine.

Although the steel makers of the West of Scotland, on November 1st, advanced the cost of steel ship plates another 2s. 6d., making the price £6 17s. 6d. per ton, there is no apparent abatement in the existing "boom," and shipbuilders can still get more work than they care to face; while all the steelworks are taxed to their utmost capacity to supply builders with anything like the speed and regularity wished for. Delivery is, in fact, more the ruling factor than price in the present situation, and this is all the more accentuated through the continued, and still growing, need for war craft, tenders for five of which—four battleships and one cruiser—are at present being prepared by Clyde builders.

During the early part of the month a strike was threatened among the steel workers in the West of Scotland, but, happily, this was averted, through a compromise being made by the employers. Through the Conciliation Board, the masters, in October, offered an advance of 5 per cent., to take place on December 3rd, but the men subsequently considered this offer unsatisfactory, holding that the selling prices warranted an advance of some 10 per cent., and that unless this was conceded they would cease work immediately. What aggravated the situation was that the masters, while agreeing to give an advance to the steel workers of 5 per cent., to take effect on December 3rd, had in the meantime arranged to give the smelters an advance, to take effect at once. The strike has been averted by the employers conceding an immediate advance of 5 per cent. to all the workmen disaffected.

The London and Glasgow Shipbuilding Co., Govan, who launched from their stocks on the 27th ult. the twin-screw wood-sheathed steel-protected cruiser *Hyacinth*, have received, during the month, an order from the Admiralty to build and engine two powerful steam tugs of the *Dromedary* type, and similar to the steam tug elsewhere noted as having been contracted for by Messrs. Barclay, Curle & Co., Whiteinch.

Messrs. A. & J. Inglis, of Pointhouse, who during the month have completed work on the two Loch Lomond passenger steamers—which have also been safely navigated up the shallow and tortuous river Leven which flows out of Loch Lomond—received about the end of October an order for no fewer than seven steamers of about 1,100 tons each, all for Mr. R. G. Reid, of St. John's, Newfoundland. For the same owner Messrs. Inglis completed in the autumn of last year the steamer *Bruce*, which has since been engaged in the passenger service connecting the Newfoundland Railway at Port-au-Basque with the Canadian Railway at Sydney, Cape Breton. The fleet of steamers just ordered is intended to overtake and develop the system of sea-connections between Canada and the Newfoundland railway termini. Messrs. Inglis also at the same time contracted with the North British Steam Packet Co. through their superintendent engineer Mr. Darling, for a passenger paddle steamer for service on the Clyde next season.

Messrs. D. & W. Henderson, Meadowside, Partick, have booked a contract for two steamers, each of about 8,000 tons gross, for Messrs. Lamport & Holt, Liverpool. For a schooner yacht—which when launched will be the largest sailing yacht afloat—now on the stocks at Meadowside, a lead keel was cast during the month into which no less than 200 tons of lead have been put. This keel is almost double the weight of any keel of this type in any other previous sailing yacht.

Messrs. McKie & Baxter, of Copland Works, Govan, who with one or two other engineering firms in the Govan district, make a specialty of the smaller class of marine engines, the combined output of which firms will this year represent several hundreds of separate sets of engines—have added to the orders already on hand the engines for three other vessels, steam yachts of 50, 60, and 70 tons respectively, which are to be built by a Govan firm. The engines will be on the compound surface-condensing principle.

Messrs. Barclay, Curle & Co., Whiteinch, have contracted with the Admiralty to build and engine a powerful steam tug, similar in all respects to one they have recently completed, as well as to the two tugs above referred to as having been secured by the London and Glasgow Shipbuilding Company, Govan.

Messrs. Ritchie, Graham & Milne, Shipbuilders, Whiteinch, booked about the end of October orders for a variety of vessels of the light-draught description, which this firm make a specialty of. These comprise three cargo barges for the East Indian Railway, for which concern the firm has already built largely, a stern wheel steamer for the African Lakes Company, and an oil carrying steamer for foreign owners.

The shipbuilding yard at Yoker occupied until recently by Messrs. Napier, Shanks & Bell, is included in the extensive and valuable tract of land recently acquired by the Clyde Trustees between Yoker and the Clydebank Engineering & Shipbuilding Company, as the site for the new tidal dock they purpose forming there. The Yoker yard and ground attached, in all 25 acres of land, cost the trustees £30,000. Another portion of land west of this extending to 38 acres cost £38,000; the combined purchase, therefore, representing the sum of £68,000. The yard has not in any way been dismantled of the machinery or fittings, and it is understood that the trustees have already arranged to lease the yard as a going concern to a new firm. This will consist of Mr. Henry M. Napier, late of Messrs. Napier Shanks, & Bell, and grandson of the late Robert Napier of Shandon, founder of the well-known firm of Robert Napier and Sons, Govan. Mr. Henry Napier will have as partner Mr. George M. Miller, for many years with Messrs. Charles Connell & Co., shipbuilders, Scotstown. As a large part of the ground will not be required by the Clyde Trustees for several years to come, this arrangement should suit them and the new firm, the name of which I understand is to be "Napier & Miller, Limited."

The Clyde Trustees some time ago asked tenders for the supply of an elevating ferry steamer for vehicular traffic similar in principle to the *Finnieston* which was supplied by Messrs. William Simons & Co., of Renfrew, eight years ago, and has since plied across the harbour of Glasgow at Finnieston. Several other firms besides Messrs. Simons & Co. on this occasion sent in offers and designs, and the proposals of Messrs. Flemming and Ferguson, Paisley, have been accepted, their tender being the lowest, amounting, it is understood, to £14,500. Modifications in the structure and carrying power being involved, investigations as to property of stability have been made. The Trustees with this in view sought the services of the well-known authority on the stability question, Dr. Elgar of Fairfield, and his report on the stability of the accepted design has been favourable. The new ferry, which will be ready about March next year is to take the place of the *Finnieston*, which is to be removed to a new station further down the harbour.

Messrs. Fullarton & Co., shipbuilders, Paisley, about mid-month booked an order to build a steamer of 800 tons deadweight for Mr. Robert Harper, Glasgow.

The Clydebank Engineering and Shipbuilding Co. some time ago approached the Clyde Trustees with the view of ascertaining whether in the event of their securing the contract for extensive alterations to the American liners *New York* and *Paris*, the Trust would reserve the largest of their graving docks for such time as might be required to overtake this work. The Trustees refused, and it is believed that on the continuance or otherwise of this refusal depends the question as to whether the original builders of these vessels will undertake the contract at once and take the work, which is of great importance, elsewhere. The work involved is no less than the lengthening of the vessels amidships, and the refitting of the machinery rooms with new boilers and new engines on the quadruple-expansion principle. Should the Clyde Trust continue to refuse, this important work will go elsewhere, although the Clydebank Co. will, in all likelihood, carry out the contract. The company, during this month, booked an order for a fast paddle steamer for the London and South Eastern and Chatham and Dover Railway Companies.

Shipbuilding operations at Port Glasgow continue so brisk that Messrs. William Hamilton & Co., who are the proprietors of two separate shipyards there, are re-starting operations in their East-end or Newark yard, which has been in disuse for some years. Their West-end or Glen yard, in which seven vessels of the largest size can be laid down, has for a considerable time been very fully occupied, and owing to the numerous orders for steamers of large tonnage which have lately been booked, they have been obliged to take the steps indicated.

The proposed new engineering works which, as detailed in last month's notes, were about to be laid down at Port Glasgow, are not now likely to proceed. Although a very good case was made out by the promoters, and the prospectus was well circulated, the response on the part of the investing and engineering public has not been such as to warrant the project being proceeded with further, at least meantime.

Messrs. Russell & Co., Port Glasgow, for many years built nothing but sailing vessels, but for a number of years past they have directed their energies almost entirely to steamship construction. The skill of their workmen, however, has continued to be requisitioned in the matter of constructing and fitting sailing ships with iron and steel masts and spars. The firm early this year received from shipbuilders in France, who had six large sailing vessels on hand, an order for the making and fitting of all the spars for these ships. A further order has recently been received for the masting and spars of no fewer than 20 sailing vessels now being built, or on order, in French yards. Messrs. Russell also undertake to send workmen to fit up the masting. It may be added that nearly 50 sailing vessels are under construction in Continental ports, a circumstance which scarcely fits in with the often expressed belief that the days of sailing ships are past.

Messrs. David J. Dunlop & Co., engineers and shipbuilders, Port Glasgow, who have already turned out vessels of the type, have contracted with The German Telegraphic Maintenance Co. to build and engine a steamer for cable-laying and repairing. She will be a twin screw steel steamer, 250 ft. in length and about 1,200 tons. Her twin engines for propulsion will be on the triple expansion principle, and there will be six other sets of engines for dealing with the cables. The vessel is to be ready for sea in May next.

Messrs. Carmichael, McLean & Co., shipbuilders, Greenock, whose berths have been fully occupied for a long time, booked, about the end of October, an order for the building of two steel screw steamers, each of about 1,600 tons gross register, for Danish owners. They are also negotiating for the construction of two steamers of still larger tonnage. Messrs. Carmichael, McLean & Co. not being themselves engineers, the engines for all these vessels will be supplied by Glasgow or Greenock firms.

Messrs. Taylor & Mitchell continue to add to the already large amount of work they have on hand, their latest booking being a powerful steam trawler.

Messrs. Kincaid & Co., engineers, Greenock, are, like most other engineering firms, extremely busy at present. They have on hand a dozen sets of engines, as many as eight of which are for vessels now under construction in the yard of Messrs. Russell & Co., Port Glasgow.

As in other shipbuilding and engineering centres, the present extraordinary demand on the productive capacity of Clydeside establishments has caused very many firms to extend their premises and enhance their working facilities. The Fairfield Co. have added largely to their enclosed area of late, and to their workshops and plant, as have also the Clydebank Shipbuilding Co., further down the river. Some of the berths in both establishments are being strengthened and enlarged, so that all of them will be available for vessels of the very largest size and weight. Messrs. D. & W. Henderson, of Partick, are about to augment their yard area very considerably, and by a slight redisposition add to the number of their launching berths. Messrs. Scott & Co., Greenock, who have, within the past year or so, largely increased their shipbuilding yard, are also now about to add to their engineering premises, as are also Messrs. Caird & Co. Within recent times many of the engineering works in Glasgow have been added to, while in several cases entirely new works have been laid down. Works of which this is true are those of Messrs. James Howden & Co., Scotland Street; Messrs. David Rowan & Sons, Elliott Street; Messrs. Hall-Brown, Buttery & Co., Govan. Through the recent fire at the works of Messrs. A. & J. Inglis, Warroch Street, that firm's premises will shortly be largely rebuilt and re-arranged.

Messrs. Murdoch & Murray, shipbuilders, Port Glasgow, have ust booked several contracts; comprising a twin-screw steamer for passenger and cargo service on the river Amazon; a screw steamer to carry 600 tons, for the Australian trade, and a screw cargo steamer of 2,000 tons carrying capacity for Friesland owners.

Messrs. Scott & Co., Greenock, have secured an order for a large steam pleasure yacht of 2,000 tons measurement. This vessel has been designed and contracted for by Messrs. G. L. Watson & Co., Glasgow, on behalf of Mr. A. J. Drexell, of New York.

Messrs. S. McKnight & Co., Limited, of Ayr shipbuilding yard, who continue to be busily employed both in the matter of new vessels and in repairing and overhauling others on their splendid patent slip, launched, early in the month, a handsomely modelled screw steamer, 180 ft. in length, 29 ft. breadth, and 13 ft. moulded depth, which they have built for Norwegian owners. The vessel, which was named the *Svend Hang*, has been constructed to the highest class of the Norwegian Veritas, and under the personal supervision of Captain Eckersberg, the owners' superintendent. The vessel is at present receiving her machinery at Glasgow. An addition has recently been made to the harbour facilities at Ayr, in the form of a new 30-ton coaling crane, which was tested by the Harbour Trustees and officials on the 5th alt. The crane is expected to be capable of shipping 230 tons of coal per hour.

The shipbuilding yard at Ardrossan, on the Ayrshire coast, owned and for a number of years occupied by the Ardrossan Shipbuilding Co., has been purchased by a company, the representatives of which hail from Newport, Sunderland, and Glasgow. Some five or six years ago business was brisk, and a considerable number of iron ships, sailing and steam, were launched. Of recent years, however, comparatively little work has been done, but a fairly extensive trade in repairs has been carried on. The price just obtained for the yard is good, and the new owners enter into possession next month.

At Irvine, the Irvine Shipbuilding and Engineering Co. contracted early in the month to build a steamer of 800 tons for the Lombard Steamship Co., London.

In the early part of November the Atlantic liner, *Alaska*, which has lain for a considerable time in the south basin of the Prince's Dock, Glasgow, was taken down the Clyde to the Gareloch, which peaceful sheet of water, as is well known, serves so largely as the haven of shelter and rest—and also, alas, the mortuary—for infirm and obsolete shipping. In 1882 the *Alaska* was the fastest mail steamship afloat. The fact of her removal to the Gareloch at this time points to the discouraging results attending recent efforts to dispose of her, and the great depreciation which overtakes even an "ocean greyhound" in the course of a decade and a half. She is, however, still too valuable to be allowed to end a career by foundering at her moorings, a fate which nearly overtook her several days after her arrival in the Gareloch. It was somehow discovered by passing voyagers that she seemed to be in a sinking condition, and, on examination, it was found that the stokehole was flooded to the extent of 6 ft. of water. Two of the Clyde shipping company's tug steamers, with pumps, were sent from Greenock, and the large steamer was quickly got under control. It was discovered that one of the sea-cocks had been left open.

At the Glengarnock Steel Works re-arrangements have been proceeding for some considerable time, and the new soaking pits which have formed part of these changes are now nearly completed. They will prove a great advance on the old system. When all the re-arrangements are in full operation fewer hands will be required, and it will be possible to carry a steel ingot from one end of the works to the other without manual labour, except in the working of machinery. Already the number of mill floor men has been reduced from about 45 to 8 men as the direct result of the new soaking pits and their appliances.

Messrs. James Miller & Co., Limited, Hobcross Works, Coatbridge, the well-known firm of rivet makers, have, for the seventh consecutive year, just secured the Admiralty contract for the supply of steel rivets to the Government dockyards. The present contract amounts to about 2,000 tons.

Messrs. Alley & Maclellan, of the Sentinel Works, Polmadie, Glasgow, have issued a neat supplementary catalogue to their Main Steam Valve Catalogue, in which is illustrated some special valves for marine use, but many of which are useful on land. The firm have special facilities for this class of work, the turnout on an average amounting to 1,200 valves per month, weighing about 150 tons. The catalogue also contains many useful tables, metric equivalents, knots and times, circles, &c.

Should present ideas as to the disposal of sewage sludge in Glasgow be carried out, a fleet of hopper barges will be required for conveying the sludge out to the open sea. How many barges will be required it is at present difficult to say, but the cost of working, taking everything into account, will not be short of £1,100 or £1,200 per barge per annum. This estimate is based on the fact that the Clyde Trust pay in wages to the crews of their dredgers and hopper barges a sum of no less than £18,000 per annum.

Mr. James Weir, of Messrs. G. & J. Weir, Holm Foundry, Cathcart, whose paper on "Combustion in Water-tube Boilers" read before the Institution of Engineers and Shipbuilders at Sheffield last summer, was discussed at the opening meeting of the Institution on Oct. 25th, is receiving hearty support in the matter of his special design of a water-tube boiler with a secondary combustion chamber. Under the title of "Weir Boilers Limited," a company has been incorporated with a capital of £100,000, divided into 2,000 ordinary shares of £50 each, which will acquire the patents connected with the boiler, and will carry on the business of ironfounders, engineers, &c. Among the subscribers are Mr. James Weir, the patentee; Mr. James Rowan, of Messrs. David Rowan & Sons, engineers, Glasgow, Mr. Walter Brock and Mr. Henry W. Brock of Messrs. Denny & Co., engineers, Dumbarton.

The Clydesdale Tube, Co. Limited, whose formation some months ago I referred to in these Notes, have hurried on the erection of their fine new works at Whifflet, and the directors now intimate in a circular that they hope to be in a position to execute orders towards the end of February next. They also state that they do not intend to join any association having for its object the undue raising of prices against home consumers This assurance was evidently thought advisable on account of its having been reported that a further combination of tube makers in the West of Scotland was about to take place, in addition to the two already formed, viz., Messrs. Stewart & Menzies, Limited, and Wilsons & Union, Limited, which if carried out, would put the whole tube making trade into the hands of three powerful combinations, which would have considerable control of the regulation of prices. It is natural therefore that the new company should wish to put themselves right with consumers. The directorate, it may be stated, includes two gentlemen, Messrs. Brown and Wotherspoon, who are well known in the commercial world, have large experience in the tube trade, and were for many years closely identified with the firm of A, & J. Stewart and Clydesdale, Limited. The new company intend to make a strong specialty of solid-drawn tubes such as are now in enormous demand for water-tube boiler manufacture, as well as the higher class of welded tubes. The extensive works which are being erected by the Clyde Structural Iron Co., Limited, themselves a new company, having their premises at Scotstown, will give employment to a large number of workmen.

Messrs. Gourlay Bros. & Co., Dundee, have contracted to build a cargo steamer, which will be one of the largest steamers ever built at the port. The vessel, which is to the order of the Brocklebank Co., Liverpool, will be over 400 ft. in length, and have a gross tonnage of about 5,000 tons, the deadweight carrying capacity being between 7,000 and 8,000 tons.

The Caledon Shipbuilding Co., of the same port, have booked an order for a high-class passenger and cargo steamer for Leith owners.

At Leith, Messrs. Ramage & Ferguson, Limited, are about to lay down the keel of a steel steam yacht of 450 tons, from designs by Messrs. G. L. Watson & Co., naval architects, Glasgow, the owner being Sir Samuel Scott.

Leith Dock Commissioners were told at their last meeting, by Mr. J. Wilson, when the auditor's reports on the accounts were being discussed, that during the past 20 years the tonnage entering the port had doubled. It was, however, still more interesting to notice how well Leith stood as to foreign trade. In 1878 the foreign tonnage entering the port was 265,449, and this year was 291,625, an increase of 10 per cent. In 1878 the tonnage of British shipping was 695,926, and during the past year 1,522,810, an increase of over 100 per cent. He thought this reflected great credit on the enterprise, energy, and skill of the Leith shipowners and shipbrokers.

The Caledon Shipbuilding Co., of Dundee, have recently booked an order for a high-class passenger and cargo steamer for East Coast owners.

At Bo'ness, on the Forth, there exists pretty deep-rooted dissatisfaction with the character and extent of the dock accommodation at the port, and this found expression on the 10th ult., on the occasion of the election of members to the Harbour Board

Referring to the grievances felt by shipowners and traders in connection with the working of the traffic at the docks, Bailie Hill said it devolved upon the local members of the Board to urge the North British Railway Co. to have the existing state of matters put right. He had always maintained the necessity and urgency for a new deep-water dock at Bo'ness. They had instances of vessels, chartered with cargo for Bo'ness, and for want of accommodation ordered to other ports; and they had also cases of vessels that would have been chartered for Bo'ness, but for the same reasons they had been chartered elsewhere. In shipping circles this created a bad impression, and was hurtful to the port, as also to the interests of the North British Railway Co. and all concerned. He believed a new dock could be made at Bo'ness for one-third of the sum that is being spent at Grangemouth. There was no entrance difficulty to contend with at Bo'ness. He believed that what assisted in producing the new docks at Methil and Burntisland was the influence of the Fife coal-masters, and he was confident if Linlithgowshire, Stirlingshire and Lanarkshire coal-masters were to use their influence, a settlement of the Bo'ness dock question would soon be satisfactorily effected.

The opening meeting of the Glasgow and West of Scotland Engine Keepers' Association took place on the 31st ult. in the Lesser City Hall, Glasgow, when a large and representative gathering was presided over by Mr. R. D. Munro, of the Scottish Boiler Insurance Co., honorary vice-president of the Association. The report of the secretary stated that satisfactory progress continued to be made in all departments, and many of the most important steam using firms now made it a condition that those in charge of their engines and boilers should hold the certificate of the Associatien. In view of the extensive application of electricity as a means of lighting and driving in mills and public works, the committee of the Association have decided to devote the whole of this session to lectures on electrical subjects, and the services of Mr. T. C. Fulton, C.E., having been secured for this purpose. The subjects of lectures are "Generation and Distribution of Electricity," "Measurement and Control," "Lamps, Motors, and Storage Cells," "Advice about Management," &c. At the conclusion of the session a lecture on the "Smoke Nuisance" will be delivered by Mr. John McGregor, the secretary.

THE TYNE.

(*From our own Correspondent.*)

Shipbuilding.—With a view to increase their own particular records of tonnage output in 1898, each of the local firms are now making strenuous efforts to forward the work on nearly completed vessels, so as to get them launched and included. Up to the present the launchings of the year have been far above the average, and as there are a good many more vessels to be put into the water between now and the end of December, the output of the Tyne yards for the year now drawing to a close is likely to be a record one.

Though inquiries are still numerous, there is less doing in the actual ordering of vessels, but this is due rather to the plenitude of work in the hands of builders than to any real falling off in the demand for steamers. Excepting in very exceptional cases, builders are not open to guarantee delivery in less than eighteen months, and under such circumstances many owners contemplating additions to their fleets are content to postpone negotiations till the congestion at the building centres has somewhat abated. The easing process will, it is argued, also influence prices favourably to the shipowners' interests, and it is considered, therefore, the better policy to wait until the inevitable slackness comes, rather than fix contracts at a time when prices are at their highest, and when the completion of the contracts must in any case be delayed to distant dates. It has, of course, to be taken into account that briskness in the ocean-carrying trade is not a permanent condition, and that those who adopt the policy of waiting for a time of lower prices may lose the chance of participating in the good trade now existing; but this possibility has to be risked, and there are many who doubtless think that in taking the risk they are acting wisely.

One of the chief troubles that are afflicting shipbuilders just now is a scarcity of skilled labour in the steel working departments. Many firms are in want of platers and rivetters—particularly the latter—and have applied to the union officials for supplies of workmen of both classes, but without success. The union authorities indeed frankly declare that they cannot supply men, as there are none idle at any of the centres where the union has branches, and all they propose to do by way of helping the employers out of their difficulty is to temporarily discontinue the payment of home donation, or "out of work" benefit, which action, it is expected, will cause men in the less active districts to migrate to centres where there is an urgent demand for their services. There is another course which they might adopt if the union rules were more elastic, and that is to increase their membership and their ability to meet the employers' requirements by admitting to the society all applicants capable of doing plating and rivetting work. If this step were adopted all needs would soon be provided for; but it is to be feared that neither the rules of the union nor the inclination of its governing body, will admit of this being done. In view of the inconvenience and annoyance that shipbuilders have had to put up with in connection with the execution of rivetting work, it is suprising that the principle of machine rivetting has not been further developed. There are, no doubt, great difficulties in the way of getting rivetting appliances to operate upon shell work; but it is scarcely to be thought that the difficulties are insuperable, and it probably only needs the additional stimulus now given by the unprecedented scarcity of hand labour to induce the more enterprising firms to apply themselves more earnestly than ever to the solution of the problem.

The Palmers Company, and Messrs. Hawthorn, Leslie, & Co., have tendered for part of the dozen additional 30-knot torpedo-boat destroyers, which the Admiralty are going to have built, and in connection with the propulsion of which the experiment of liquid fuel is about to be tried. It is also expected that the first-named company will be among the competitors for the fast cruisers that are proposed to be given out to private yards, and that Messrs. Armstrong, Whitworth & Co., will also compete for a share of this work. It is indeed the general impression on Tyneside, that the Palmers Company's Howdon yard—which is still inoperative—has been reserved for the carrying out of Admiralty contracts. Tyneside firms could very well afford to let the government work pass them this year; but this would possibly involve a loss of prestige, and at the risk of being even more inconvenienced by pressure of work than they are now, they have sent in their estimates.

At Messrs. Armstrong, Whitworth & Co.'s Elswick Yard, activity is still the rule, and it is expected that another large warship will be launched before the end of the year. Night work is continued in the frame turning department, and in the designing offices things are more than usually brisk. The Company's Low Walker yard is also showing sustained briskness, and the berth which was occupied recently by the mammoth ice breaker *Ermack*, is again being utilised, the keel blocks for a large vessel having been placed. The Company have received an order for another ice breaker, similar in design and dimensions to the *Sampo*, launched in April last.

The Company's great resources in shipbuilding are now pretty severely taxed, but should the pressure become more urgent, they have still the Scotswood yard to turn to account for productive purposes, if they are so minded. True, that establishment has been dismantled and converted to other uses than shipbuilding; but it could not take many weeks to restore it to its former condition as an unencumbered area, nor to putdown the requisite plant, and it is not beyond the bounds of possibility that, should the necessity arise, this may yet be done.

Messrs. C. S. Swan & Hunter launched, towards the end of October, a fine vessel named the *Osborne*, ordered by Messrs. Raeburn & Verel, Glasgow, and which is to carry 6,600 tons of cargo, on 23½ ft. draught. The firm have built a number of vessels for these well known owners, and it is no small compliment to this Tyneside firm that so many repeat orders should come from the Clyde. It is, of course, a compliment of still greater significance that they should have been commissioned to build for the Cunard line, not only a cargo boat of more than ordinary capacity, but a passenger vessel to rank among the largest and best.

None will deny that the firm are worthy of the compliment, who have knowledge of their high achievements in shipbuilding, and the immense pains they have taken to place their three yards and the various accessories connected with them on a footing of equality with the best shipbuilding establishments in the kingdom.

Messrs. Hawthorn, Leslie & Co. are among the firms who have tendered for the additional torpedo-destroyers now being ordered and it is confidently expected that they will get one or more to build. The firm launched, on the 15th inst., the first of three meat-carrying steamers ordered by the New Zealand Steam Shipping Co., and the vessel is now receiving her machinery at the St. Peter's Works. The vessel, which is named the *Wakanui*, is a fine specimen of a cargo boat, and well fitted to sustain the reputation of the builders, both in design and finish. It has just been announced that the firm have received an order for two large Atlantic liners.

The rumour has become current that the Palmers Co. are about to avail themselves of the accommodation provided by their Howden yard to ease the congestion which is now very perceptible at their Jarrow establishment. This, it is supposed, is sure to be done if the representatives of the company are as successful as they hope to be in competing for the Government work now on offer, or about to be. At the moment there is a lot of repair work at the Jarrow yard, and the new work being abundant, the pressure of work felt is, perhaps, unprecedented.

The Tyne Shipbuilding Co. have placed the keel for another boat in the berth from which was launched early in the month the ss. *Sirdar* for Messrs. Stephens and Mawson, Newcastle. At Messrs. Readhead's yard continued activity is to be noted, and the proprietors of the Northumberland Yard have added to the work in hand an order for an exceptionally large steamer, from Messrs. Leyland of Liverpool.

Messrs. Wood, Skinner & Co., have booked some further orders from Norwegian owners, and have now as much work as they can deal with in the next twelve months. The firm are somewhat inconvenienced, through the want of rivetters, the supply of that class of men not being quite up to requirements. Possibly in this and other cases, machine rivetting will soon be brought more prominently into requisition. The large pontoon which was ordered a couple of years ago from Messrs. R. Stephenson & Co., by the Spanish Government, and which when completed was to have been located at the Philippines, is now, it is understood, quite ready for being despatched in sections, as originally intended. It will be patent to all, however, that owing to changes brought about through the Spanish-American war, the destination of the pontoon must now be altered. It is, we believe, the intention to ship the pontoon to one of the principal ports in Spain; but the port has not yet been definitely selected, and until this is done no shipment will take place.

In repair work, the Tyneside establishments are now pretty full, there being, besides the *Milwaukee* and the *Knight Errant*, another large new steamer, the *Manchester City*, under repair in the port. All of these fine steamers came to grief very early in their career; but they will soon be under steam again, and it may be hoped that their future will be more fortunate.

Engineering.—At all the marine engine works new orders have been booked; but in every case, long terms for delivery were asked for and allowed. Night work is still the rule at all the factories, and as the night work staff is usually less numerous than the day shift one, the working of a certain amount of overtime is, in many cases, arranged for.

The mishap to the ss. *Westmeath* and her subsequent adandonment, has been the subject of much comment lately, the main interest of the matter being centered in the frequency of accidents of this nature. It was the propeller shaft which again failed, and though no enquiry has yet been held, we may hazard the conjecture that the weakness which caused the failure, was to a greater or less extent, due to corrosion.

There would have been loss of life, as well as loss of property in this case, if the rescuing steamer had not come up in the nick of time. One is lead to inquire, by these considerations, how many more fine steamers, with possibly their crews, will go to the bottom in mid-ocean, before something is done to put an end to these mishaps to propeller shafts? If such accidents are preventible, it is strange that shipowners and underwriters do not take the necessary steps to prevent them. We have heard of one patented appliance which is said to effectually protect, for an indefinite period, any propeller shaft to which it is applied. This is Cedervall's Protective Box, for which Mr. George Noble, of 7, Dean Street, Newcastle, is principal agent. The power of protecting from corrosion is claimed for it, as well as perfect lubrication of the parts and we think the parties mentioned should be sufficiently interested to give the matter their serious attention.

Messrs. Isdale & Farrow, of 4, St. Nicholas Buildings, Newcastle, are having considerable success in pushing the sale of McDougall's patented specialities (manufactured by Messrs. W. B. Haigh & Co., Ltd., Globe Iron Works, Oldham) in the North-Eastern district. These are, the improved patent steam traps, and the patent oil extractor and separator, the respective purposes of which are to eject the water of condensation from steam pipes, drying cylinders, engine cylinders, &c.; and to prevent oil and other foreign matter passing into the boiler with the feed water. Both these specialities are being adopted in steamships, and are in every instance giving excellent results.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—A rumour has been current for some time that one of the oldest shipbuilding firms on the Wear would shortly have to remove their business from the premises they have occupied for many years. We don't know how much of truth there may be in this, but even if the firm have to leave there will be no great harm done, as there are other sites available, and the advantages to be derived from having a modernly designed and equipped establishment are such as to counterbalance a good deal of loss, as well as the trouble of removing.

It is understood that Messrs. S. P. Austin & Son contemplate the lengthening of their graving dock and other important developments. They have just demolished an ancient public-house which stood in the line of their projected improvements, and have still a good deal of obstructive matter to remove in the shape of earth and rock before the ground is ready for their purposes.

Messrs. J. L. Thompson & Sons are fitting out at the Manors Quay a vessel which is specially designed for traffic on the Manchester Ship Canal, and we believe that others for the same destination are in earlier stages. The firm have also some repair work in hand, and are as busy as possible in all departments of their works.

Messrs. Doxford, it is understood, are not going to lay down the P. & O. boat which was ordered from them till next year, there being other orders which have precedence.

The firm have tendered for the additional torpedo destroyers, and very little doubt is entertained that they will get as usual a share. The largest "turret" ship yet built—the *Noranmore*—is being fitted out beside the yard, all departments of which are as busy as could be wished.

At Messrs. Short Bros. an extension of the electrical system is being carried out with a view to transmit current to the repairing department some distance eastwards from the yard. We understand that the punching and shearing machines at this yard that are driven by electric motors run at a higher rate of speed, and with steadier and more uniform action than those driven by steam. There is also less vibration, so that in all respects, electrical power for shipyard machinery seems to be suitable and advantageous. At the three Southwick yards business still continues active, and at Sir James Laing's establishment work seems busier than ever. It is understood that all the machines which are being put down in the new yard will be driven by electric motors.

Engineering.—At the Palmer's Hill Works the activity previously noted is fully sustained, and a range of new buildings which the firm are erecting in the vicinity of their present works is well advanced. It is understood that the buildings are intended for offices, which will be fitted up in a very complete style, and fully in accordance with modern requirements. An extension of the boilermaking department is, we believe, also contemplated.

At the Southwick Engine Works, business continues to be very active, and it is understood that the contracts still to be dealt with are both numerous and important.

Messrs. Doxford are busily employed, and the same description applies to the North-Eastern Works, South Dock, and to the works of Messrs. Wm. Allan & Co. At the forges the pressure of work continues, all the local establishments being quite full of orders. At the Pallion Forge additional plant has recently been put down, by which the productive power has been much enhanced. Mr. Thomas Ray, the proprietor of this establishment, is one of the oldest forge masters in the kingdom, and we are pleased to note that both as regards the quality and quantity of the work turned out from this place, he is still able to show a highly creditable record.

The Monkwearmouth Iron Works are kept actively going, and the same may be said of the Monk Street Foundry, where a good deal of overtime is now being worked. The management have recently received an order from a local engineering firm for three cylinders, the aggregate weight of which will reach 24 tons. The Sunderland Forge & Engineering Co. are very actively employed especially in the electrical department, where lighting and transmission contracts are plentiful.

The Hartlepools.—In the shipbuilding and repairing yards the state of work remains unchanged, exceptional activity being still the rule. The Hartlepool Steel Works are full of orders, and work is continued night and day. It is reported that a change in the constitution of this company is about to take place, which among other things will have the effect of bringing about a further increase of productive capacity. The engineering works remain quite busy, and at the docks there is a fair amount of work going on. Timber imports are, however, now smaller in quantity, and the unmistakeable signs of a closing season are in evidence.

Stockton.—The great difficulty with shipbuilders at this centre is the scarcity of skilled labour, which is every day causing greater inconvenience. In spite of this, however, it is confidently anticipated that the year's output of tonnage will be very considerably above the average.

Middlesbro'.—At Messrs. Raylton, Dixon & Co.'s yard there are several contracts of exceptional importance in progress, and at both Messrs. Cragg's and Messrs. Harkess's establishments the state of work is satisfactory. Engineering and boiler works are still fully employed, and bridge works are kept fairly busy. Foundries are also well employed, and at the steel works there is no abatement of activity. At the docks business is scarcely so brisk as it was a month ago.

THE MERSEY.

(*From our own Correspondent.*)

THE position throughout the engineering and shipbuilding trades of this district continues one of exceptional pressure of work in hand, with prospects of full employment for some time to come. Not only is the recent activity well maintained, but there is a briskening up in one or two departments which have of late been scarcely in so satisfactory a position as other branches of engineering industry. Marine engineers, machine tool makers, boiler makers, and stationary and locomotive engine builders are generally full of orders to carry them over the ensuing year, and the leading shipbuilding firm in the district is well engaged on important orders. There is, however, some slackness amongst ship repairers in Liverpool, but this is attributed to the fact that a large proportion of the vessels are now at sea.

The activity in practically all branches of the engineering industry is reflected in the employment returns issued by the leading trade unions. The Steam Engine Makers' Society has only one per cent. of its membership on donation, whilst in Manchester and other large Lancashire towns there are practically no names on the society's donation list, the officials, in fact, reporting that they find it impossible to supply employers with certain classes of workmen. The United Machine Workers' Association has only two per cent. of its Manchester members on benefit, and apart from Bolton and Oldham, where there is still a large though decreasing proportion of unemployed, the Lancashire branches have not more than ¼ per cent. on donation. In this society, the following towns have a "clear book" so far as unemployed members are concerned:—South Shields, Sunderland, Hartlepools, Horwich, Elswick, Stockton-on-Tees, Keighley, Bradford, Doncaster, Grantham, Halifax, Dundee, Blackburn, Lancaster, Crewe, Preston, Gloucester, Newcastle-on-Tyne, Erith, Woolwich, Edinburgh, Wigan, Loughborough, Grimsby. Of 48 branches of the society 35 report trade as "good," nine as "fair," three as "moderate," and only one as "bad.'

The Mersey Dock and Harbour Board has accepted the tender, amounting to over £250,000, of Mr. C. I. Wills, of Manchester and London, for the construction of a new dock, &c., in connection with the Queen's Dock, and the work will be commenced immediately.

James Spencer & Co, Hollinwood, are bring out several improvements in drilling tools, specially adapted for the engineering, boiler making, bridge building and shipbuilding trades. Amongst these is a portable self-feeding drilling tool, suitable for work not easily removable to an ordinary drilling machine. This tool is very effective in operation and is adapted for most of the work usually done by the ratchet brace, whilst it is at the same time very much quicker in operation. It will drill holes at any angle and in almost any conceivable position. The pillar is fitted with a specially designed bracket, having an extra swivel joint, by means of which the adjustable arm can be set to any angle with the pillar within a certain range. The feed motion is self-acting, with quick traverse for bringing the drill to and from its work. The machine is made in different sizes to drill holes ⅛ in. to 1¼ in. diameter, and it is also made in a form suitable for bench use. Another improved design is a sensitive high-speed drilling machine, for fine drilling and centering and which will be found very useful in all shops where large numbers of small holes have to be drilled, as it is easy of adjustment and expeditious in working. The spindle, which is driven direct by belt without the aid of gears, runs on a long sleeve bearing, and is balanced by a weight running down the centre of the column. The feed motion is worked by a lever, which can be readily adjusted so that the operator can feel the cut very sensibly, and use such pressure as will exactly suit the size of hole to be drilled, and in addition to this lever a special treadle arrangement is provided by means of which the operator can work the feed even when he is compelled, for any reason, to take his hand off the lever. The pulleys are accurately turned so that they are well balanced when running at a high speed. The machine is self-contained, the driving apparatus being carried on a baseplate, and is started by a treadle lever, so arranged that immediately the foot is removed from it the machine stops. The spindle is 1 in. diameter, and the range of feed 4½ in., whilst the machine will drill holes up to ⅜ in. diameter, and weighs about 5 cwt. The machine is fitted with a two-jaw self-centreing chuck to grip any size of drill, with parallel shank from 0 to ½ in diameter.

The strong tone that has characterised the iron trade here for some time past is fully maintained, and during the past month prices have made a further substantial upward move, with both makers and manufacturers generally so well sold that they are unable to quote for anything like prompt delivery. In pig iron there is a fairly large enquiry, and prices all round are about 1s. to 2s. higher as compared with last month. Delivered Manchester, Lancashire foundry is now quoted 52s. 6d. less 2½d.; Lincolnshire, No. 4 foundry, 50s., and No. 3 foundry, 51s. 6d. to 52s. 6d. net, and Derbyshire foundry, 54s. net cash, with forge qualities, delivered Warrington, 50s. for Lancashire, less 2½; and 49s. 2d. to 50s. 2d. for Lincolnshire net cash. Most of the makers, however, have so little to offer that their quoted rates are scarcely more than nominal, at any rate for prompt delivery. With regard to outside brands offering here, Middlesbrough has shown a strong upward move, and for good foundry qualities 54s. 9d. to 54s. 10d. net is being asked for prompt specification, by rail Manchester, but 1s. less might be taken for delivery next year. Scotch iron has also been advanced, Glengarnock being now about 55s., and Eglinton 55s. 6d. to 55s. 9d. net cash, delivered Manchester Docks. American brands are now quoted from 50s. to 52s. net, Manchester Docks.

In the finished iron trade prices for all descriptions have been further advanced. Bar makers, who are well booked into next year, have put up their list rates 5s. per ton for Lancashire qualities, which are quoted at £6 10s. as the minimum, whilst North Staffordshire bars now range from £6 12s. 6d. to £6 15s. Sheets are also stronger, £7 5s. being the average quotation, and list rates for hoops have been raised 5s. per ton, the basis being now £7 for random to £7 5s. for special cut lengths delivered Manchester district, and 2s. 6d. less for shipment.

Nut and bolt makers are preparing a revised advanced list, and in the meantime are getting higher rates on business offering.

An exceedingly firm tone prevails throughout the steel trade. Activity is maintained in all departments, and prices go on advancing. Hematites are now quoted 65s. 6d. to 66s. 6d. and less 2½, local billets £4 12s. 6d. to £4 15s. net cash; steel bars £7 to £7 5s.; common plates £7 5s. to £7 10s., and boiler plates about £8 to £8 5s. delivered in this district.

A brisk demand comes forward on all descriptions of manufactured metal goods, especially for engineers, boiler makers, stationary and locomotive engine builders, and marine requirements. The result has been that list rates have been put up on most descriptions ¼d. to ½d. per lb. rolled brass, brass sheets, brass and copper wire, and brazed brass tubes being ¼d. per lb. higher, and condenser plates ½d. dearer. Solid drawn tubes remain as last quoted, special causes evidently operating to keep back the advance that would naturally be expected from the present strong position of the market. Delivered in this district, list rates are now as under:—Solid drawn brass boiler tubes, 7½d; solid drawn brass surface condenser tubes, 8¾d.; solid drawn copper tubes, 8¾d.; brazed copper gas and steam tubes, 8½d.; brazed brass tubes, 8½d.; common rolled brass, 6¾d.; brass sheets, 7½d.; common brass wire, 7d.; copper wire, 8d.; yellow metal condenser plates, 6d.; naval brass condenser plates, 6¼d. per lb.

The timber trade has shown a slight improvement during the past month. Deliveries have been on a more satisfactory scale, and prices are firmer, with an upward tendency. Imports have been moderate, and stocks, with few exceptions, are not excessive. In East India teak both logs and planks have come forward more moderately. There is a fair enquiry and prices are stronger, but the stock is ample. Of greenheart no cargoes have arrived, but the demand is only very limited, and the stock is large.

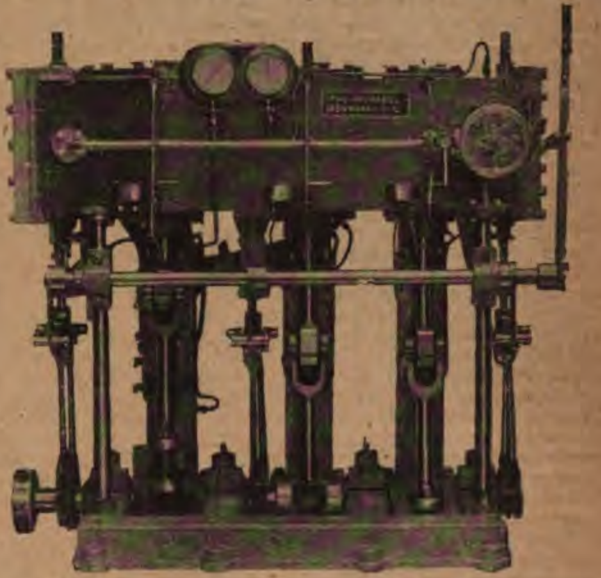
The position in the coal trade here is one of increased activity. House coals are meeting with a more active demand, and pits generally are kept on full time, with prices maintained on the recent list basis, best Wigan Arley averaging 11s. to 11s. 6d.; Pemberton four foot and seconds Arley 9s. 6d. to 10s. 6d.; common house coal 8s. to 8s. 6d. per ton at the pit mouth. The lower class round coal are finding a good inland sale for iron-making, steam, and general manufacturing purposes, and prices are firm at about 7s. 9d. to 8s. 3d. for good steam and forge descriptions at the pit mouth. Engine fuel is in a brisk request, at any rate as regards the higher qualities, which are rather scarce at some collieries, and show an upward tendency in price. The commoner sorts, however, scarcely occupy so strong a position, and are still obtainable at rather low figures. At the pit mouth best qualities average 5s. to 5s. 6d.; good medium sorts 4s. to 4s. 9d. with common slack still offering at about 3s. 6d. per ton.

There is a tolerable weight of shipping business offering, but this branch of trade has been considerably interfered with by the advance in freight and the difficulty in obtaining vessels at the ports. Prices are rather easier, and ordinary steam coal does not average more than 9s. 3d. to 9s. 6d. delivered at the Mersey ports.

THAMES.

(From our own Correspondent.)

THE Vauxhall Iron Works Company are still very busy, mainly with ammonia machines. At the present time there are seven being made in the shops, six of which are belt-driven and one to be driven by an engine. They are for the Lindey Co. Those made for the Admiralty are of the dry-air type. Many companies use the ammonia process of refrigeration. The same effect is produced in both cases; but the energy absorbed by the ammonia process is much less than in the other. They have the usual large number of pump orders on hand, and the engine for the launch with the patent propeller in the North of England has been fitted on board and tried in dock. Her speed developed, however, has not been yet given. All the engines made by this firm are fitted with the circular-balanced and double-ported slide valves; the pressure is much less, power for power, than the ordinary D slide valve, and consequently the friction and work of the eccentric and reversing gear is much less. The valve consists of a cylindrical ring, the inside edge of which acts as the edge of the valve for the admission of steam. The ports which lead to the inside of the cylinder against this edge are semi-circular, and present therefore a long valve opening, and therefore it does not require a long travel of valve to obtain the necessary opening to steam. The makers state that the travel is only half that necessary in engines of the same horse-power, fitted with ordinary slide valves. The valve chest cover also has ports in it which communicate with the cylinders, and these serve to double the size of the port. The outside edge of the valve serves as the opening to exhaust and the steam in issuing to the exhaust-passage at the outside of the valve comes through the ports in the cover and the ports in the cylinder. Again, because one face of the valve bears against the steam chest cover and another face bears against the steam chest face it is a balanced valve. The steam enters the valve through a passage similar to the exhaust in the ordinary engine, and so reaches the inside of the ring which forms the valve. The exhaust enters the space on the outside of the valve, and is taken up through a branch in the valve chest. In consequence of easy running the valve gear is made much lighter with this kind of valve. Experiments are being made by the Vauxhall Iron Works Co., to ascertain the relative proportion between the pressure required to move this valve and to move one of the ordinary kind, and this will be published in our next issue.



We herewith also give an illustration from a photograph of a triple-expansion engine made by the Vauxhall Iron Works Co. The cylinders are 6 in. by 10 in. by 17 in., and the stroke is 10 in. These engines we referred to in our issue of September, but we could not illustrate at the time, since no electro was then prepared.

The Vauxhall Iron Works Co. have also a standard oil separator for taking out the oil from the exhaust steam. It consists of a cylindrical wrought-iron vessel riveted. At a branch near the top the exhaust steam is introduced to the vessel and strikes against a deflector, and it expands and lowers the temperature and so the steam cannot hold the oil in a gaseous state which it carried at greater heat. The change of direction of the steam by the deflector causes it to flow down on the water and the water retains the particles of oil in suspension, and it is carried away by the grease overflow-pipe. The steam has next to impinge against angle iron bafflers and then again attract the grease. By the time the grease has gone through these obstructions the most of it has fallen into the hot-well at the bottom of the vessel. There is also a water softening apparatus, The hard dirty water is blown into the upper heater in spray, and is there met by steam, either live steam or exhaust, until the water boils, and a solution of calcide is introduced. The heated water and calcide pass down several concave and conical surfaces in the heater, becoming thoroughly mixed, and the lime and impurities separate out and fall to the bottom of the first compartment. It then goes through two other compartments and out at the suction pipe to the boiler-feed pump.

Messrs. Maudslay, Sons & Field do not make feed-heaters to work with the Belleville boiler since the Admiralty do not use them, but they now construct the boiler in two parts, that is, they make two boilers of it, each element being seven rows of tubes high instead of ten elements high as formerly. But the firm make a feed-heater, and it is of a very original and modern design and very good results should be obtained from it, but we have not as yet been supplied with those. The manner and design of the fitting in of the steam tubes is not unlike that of Messrs. Caird & Rayner. It consists of a wrought iron rivetted shell which widens out at the top. There is an internal shell also of wrought iron and riveted. The water is fed into the annular space between the shell and an inner copper cylinder at the top of the apparatus the feed-water comes into contact with the heating coil and flows in a downward direction, at the same time circulating round the heating coils inside the copper cylinders. Air and oily substances gather on the top of the apparatus and are drained away, leaving only the pure superheated feed-water to pass from the bottom of the heater direct to the boiler.

The trials of the boilers of the *Sheldrake* in dock took place last week. The pressure attained was 225 lbs., and consumption per square foot of grate was first small, then raised to 25 lbs. This latter consumption was obtained with a draught of 3·10ths of an inch of water. There was not any leak in the tubes nor any hitch of any kind, and the evaporation of steam per pound of fuel consumed was 10½ lbs. The water in the feed was 54 degs. Fah., giving 12·49 lbs. evaporation from, and at 212 degs. The temperature of the stokehold was 79 degs. Fah., and the engineer and stokers expressed themselves pleased with the boiler. The H.P. required by the Admiralty was obtained at the consumption of 25 lbs. per square foot of grate.

The interesting point of feed-water heaters at the present time is the plan adopted by Mr. Yarrow and John Penn & Sons to introduce the feed in such a manner that it gets heated before it reaches the water taking part in the main circulation of the boiler. It is interesting also to know that Mr. Mumford, of Colchester, made an arrangement of this kind three years ago with his old design of water-tube boiler. That old design consisted of bundles of tubes attached to branches communicating with the top and bottom drums. There were some five separate bundles on each side, and there was a diaphragm of refractory material down through the tubes from end to end, separating them into two parts. The hot gases first heated the tubes next the furnace, then turned at the back of the boiler and came back amongst the outside ones towards the front, and then to the up-take. Mr. Mumford arranged that the feed should enter the bottom branches of the two front bundles and flow up the tubes immersed in the gases just before they reached the up-take. This was the coolest part of the gases, and the cold water going in at that place only cooled them down still lower in temperature, while when it reached the water in the steam drum it was well heated, and ready to take part in the main circulation. The branch which the feed-water entered was divided by a diaphragm so as to keep separate the feed-water in its outer portion and the water connected with the inner tubes and the main circulation.

BELFAST.

(*From our own Correspondent.*)

At this season of the year, things are generally termed "flat" in trade parlance, owing to the balancing of books, squaring accounts, and getting estimates for material required for ensuing year. All over advanced prices are quoted for material for engineering and shipbuilding, yet this does not prevent enquiries being made and orders being booked, which augurs well for the coming year. It is to be hoped that amicable relations may continue between employers and employees, but already it is reported that the engineers are on the war path for another advance of wages, although in a quiet way, and it is a certain fact that good men are scarce in this district.

During the past week, the Belfast Harbour Board have passed a resolution to go forward with a large dock extension, which in the opinion of many has been too long delayed, as the imports continue to increase, causing delay and inconvenience to shippers through want of proper dock accommodation. This want is also felt by the cross channel services, which have increased enormously of late, as also our foreign traffic. Should the scheme proposed be carried out, it will be of exceptional advantage to the shipbuilding trade, inasmuch as they will have material landed at their very gates, thus saving a vast amount of expense and time by having to be carried from north to south side of the river as at present is the case. It will also prove advantageous to the coal trade and will open up a vast piece of ground suitable for works of various sorts. It is said that already enquiries have been made with a view of erecting shipbuilding and other large works thereon. The estimated cost of these harbour extensions is £239,000, and it is expected that Belfast shipbuilders will then be able to tender for Government work, which at present they cannot do, owing to the want of a suitable dry dock and other accommodation. In passing we might mention that the large steamer *Oceanic* which is being built at the Queen's Island, will be launched in January and great interest is being manifested in this vessel, as it is reported that engineers from the United States, France, Germany and the Clyde have intimated their intention of being present at the launching ceremony. The other day a section of one of her propeller shafts previous to being put into the ship was photographed on the Queen's Road; its length is upwards 30 ft. and almost 3 ft. in diameter.

Messrs. Harland & Wolff, Limited, launched on the 15th inst., another magnificent addition to the White Star Line, named the *Afric*. She is the first of three duplicates, her dimensions being—550 ft. long, 63 ft. beam, 44 ft. deep, and gross register about 12,000 tons, and her displacement will exceed 20,000 tons. The *Afric* is the twelfth steamer of the White Star fleet propelled by twin screws.

The same builders have another very large vessel on the stock nearing completion, and intended to be launched in January for the splendid fleet of the Union Steamship Co. She will be named the *Saxon*, and is a vessel of over 10,000 tons gross, driven by twin-screws. She is intended for their mail service, and it is interesting to note that with this addition, this company will have the largest fleet of twin-screw steamers in the world. The following is a list of their vessels:—*Saxon* (building) 10,300 tons; *Briton* 10,248 tons; *Scot* 7,815 tons; *Norman* 7,537 tons; *German* 6,830 tons; *Gascon* 6,288 tons; *Gaika* 6,288 tons; *Ghoorka* 6,288 tons; *Guelph* 4,916 tons; *Greek* 4,747 tons; *Gaul* 4,744 tons; *Goth* 4,733 tons. The *German* which has left this port during the month is the latest addition to their intermediate fleet, and is in most respects similar in build to the *Gascon*. She will leave Southampton on her maiden voyage to the Cape about the end of next week.

The s.s. *Quernmore*, built and engined by Messr. Workman, Clark & Co., for Messrs. Wm. Johnstone & Co., Limited, Liverpool, ran her trial trip in Belfast Lough on Saturday, 12th inst., previous to her departure for Liverpool. This vessel has been specially designed to suit the requirements of her owners in the American cattle and cargo trade, and has been built under the classification of the British Corporation of Shipping, Glasgow, and takes their B S. Class in addition to complying with the Board of Trade requirements for a passenger certificate and the American regulations. The leading dimensions of this vessel are:—Length, 480 ft.; breadth, 52 ft. 3 in.; depth, 38 ft. moulded, with a gross tonnage of 7,300. She will be able to carry about 800 head of cattle, accommodation for which is given under the shelter deck as well as under the bridge deck. Powerful refrigerating machinery has been supplied by the Kilburn Refrigerating Co., and two complete sets of electric lighting plant have been supplied by Messrs. W. H, Allen & Co., and for the rapid discharge of cargo nine powerful winches have been fitted, giving each cargo hatch a winch. The engines are triple-expansion, capable of developing 4,500 I.H.P., and have cylinders of 29½ in., 50 in., 82 in. diameter, with a stroke of 60 in., steam being supplied by four large steel boilers at a working pressure of 200 lbs. Like the hull, the machinery has also been classed under the British Corporation and surveyed by them as the building of hull and machinery proceeded.

The land engine and textile machinery makers continue to be well employed, so also is the case with foundry work, and we trust that next year Belfast shipbuilders will crown their achievements by the launching of the *Oceanic* and the building of the *Shamrock*, which undoubtedly will beat Yankee creation.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow.—The shipbuilding and marine engineering trades of this district remain very briskly employed. Every department is working at its full strength, and there is every reason to believe that the present state of activity will be maintained for a considerable time to come. No new orders have been reported during the month, but a very full programme of work is in hand, and builders are pushing them forward in every department, with the view of preparing the way for other work now in the market. There is a very good enquiry for new tonnage, and builders are likely to secure important new orders to follow those now on hand. This probability is evidenced as much on warship as on mercantile marine account. The work of tendering for new Admiralty contracts has occupied much attention during the month. Amongst the new orders to be tendered for are those for four first-class line of battleships of the *Formidable* class, and twelve 30-knot torpedo-boat destroyers. It is probable that work will soon come to hand for foreign navies. In the meantime, work is proceeding apace with the contracts in hand. At Messrs. Vickers, Sons and Maxim's Naval Construction Works H.M.S. *Vengeance* is getting well forward. She will not be launched this year, but will probably leave the stocks in February. Her engines and boilers are well forward, and there is reason to believe this battleship will be completed and delivered to the Admiralty in the shortest time on record. H.M.S. *Amphitrite*, first-class cruiser, is nearly ready. Her engines and boilers are fixed, and a whole army of men are employed in her various departments completing her outfit. She will be ready for her dock trials either immediately before or immediately after Christmas. The keel of H.M.S. *Hogue* has been laid, and her ribs are ready for lifting into position. Her sister ship, the *Euryalus*, has not yet been laid down, but the preliminary work in connection with her construction is proceeding satisfactorily, and the keel plate will soon be laid. The Japanese battleship will occupy one of the permanent ways in the yard, and her keel plate is being prepared to put down. The other work in the yard—viz., for the British and African Steam Navigation Co. two steamers; the Pacific Steamship Co. one steamer; the Clan Line, one steamer, and Sir Wm. Wills, a steam yacht—is all proceeding with a celerity commensurate with the large number of men now employed. It is evident that in six months many of the ships now on the ways will be launched, and room given for other important orders that are pending or are the subject of negotiation. It is found difficult to get men in many of the branches of the trade for two reasons—first, because there is a big demand for men throughout the country, and secondly, because of the scarcity of house accommodation in Barrow at present. A good deal of new property is being built in the town, but it is not being provided on as large a scale as the demand. Still another 1,000 houses are required in Barrow, and many who are in the know believe that double the number will be required in the early future, owing to the great developments that are going on, and the way in which openings are being made for skilled and unskilled workmen. It is believed in some quarters that Barrow will soon emerge from a town of 60,000 inhabitants and rise to a town of 100,000. The present check to progress is the need of increased house accommodation. What is wanted is some big scheme whereby large building estates can be built upon, and a large number of houses provided for workmen. There is a good prospect here for anybody with capital, and the assurance of a good and permanent return on the outlay.

Gratifying evidences are afforded on every hand of the progress Messrs. Vickers, Sons & Maxim are making in relation to the several departments of their many-sided business. The Naval Construction Works at Barrow not only deal with the building and the engineering work of ships of all classes, but a new department has recently been added to deal with gun-mountings pure and simple, and in this branch of their work it is satisfactory to know that Messrs. Vickers have received orders for hydraulic mountings for three first-class battleships and two first-class cruisers, and the firm is also supplying the mechanism for all the guns of the 12-inch type, made either at the Armstrong's works, or at the Royal Ordnance factories at Woolwich. Only the initiated can have any idea of the amount of work these orders represent. In the course of a month or two, the new bay, 650ft. long, erected alongside the engineering shops at the Naval Construction Works, for the purpose of making gun-mountings, will be ready for occupation, and it is already evident that although great extensions have been made to many of the shops in the works, they will not be adequate to the growing demand for expansion. Indeed, further extensions are contemplated, and it is no secret that the firm is making overtures for a very large accession of land on which to develop the business of shipbuilding, marine engineering, &c. In the meantime, very large and valuable tools are being put down in all departments, and more have yet to come. It is quite clear that Messrs. Vickers have formulated a big scheme of development at Barrow, and as the circumstances of the situation are playing into their hands in regard to the very great demand for warships for the home and foreign Governments, the speed with which these developments is being accomplished is as justified and reasonable as it is remarkable.

The Furness Railway Co. are promoting a Bill in Parliament next session, in which they are seeking powers, amongst other things, to build a new lock in connection with the Ramsden Dock at Barrow. At present a lock exists between the entrance basin and the dock proper. It is 600 ft. long, and has a width of 100 ft., but while the depth of water in the entrance basin and the lock is 30 ft., the depth in the dock is only 24 ft. It is possible to dredge the dock to the required depth, but a difficulty would arise owing to the cill of the lock lifting 6 ft. above the level of the lock. In view of the heavier and larger type of warships, &c., building at Barrow now, it has become necessary either to lower the cill of the existing lock, or construct a new lock altogether. Vessels, when they are launched at Barrow, are towed from Walney Channel into the docks, and then make their way through the entrance basin and lock to the Devonshire dock, where the 120-ton hydraulic crane is built, and here they receive their boilers, engines, and fitments. Orders are in hand at present at Barrow for ships which will draw 27 ft. or 28 ft. of water when thoroughly equipped for sea, therefore there is urgency in the work either of lowering the present cill or building a new lock altogether, and the Furness Railway Co. are taking powers to do either one or the other, or both. The easiest way out of the difficulty will be the building of a new lock, but of course it represents a very expensive undertaking. Yet in building this lock, it could be arranged to fit it up as a big graving dock, for which there is at Barrow and at many other places a big demand, especially seeing the heavy shipping now-a-days built. The new lock would by this means serve a dual purpose, and be the means of bringing to Barrow a new and important branch of trade. If the company decide to lower the cill of the present lock, it will stop up the docks for many months, and make it impossible for Vickers, Sons & Maxim to build heavy tonnage in the meantime, as they would not probably be able to get more than a 6.000 tonner through the entrance basin of the Devonshire Dock. This course would therefore seem to be an impracticable one.

The returns of shipbuilding for the year at the Naval Construction Works have been made up, and are very interesting as showing the expansion of business that has taken place. The returns show, in fact, a period of unprecedented activity. During the year orders were booked for two first-class armed cruisers, and one first-class battleship for the British Admiralty, and one first-class battleship for the Japanese Government. These orders represent a total displacement of 39,200 tons, and a total I.H.P. of 57,000. Contracts have also been placed for three mail and passenger steamers, and a first class steam yacht, making a tonnage of 14,400, and an I.H.P. of 11,950, so that the total tonnage placed amounts to fully 53,600 tons, and the I.H.P. to fully 68,950, which beats all previous years, and in addition to this orders have been placed for hydraulic mountings for five warships. During the year the following vessels have been launched, including the last two on the list, which will be launched during December;—

Name of vessel.	Gross tonnage.	I.H.P.
Jeannette, steam yacht	312 y.m.	500
Duke of Cornwall, t.s.s.	1,560	6,000
Anglia, cable steamer	6,300	3,500
Amphitrite, first-class cruiser	12,100	18,000
Clan Ferguson ,, s.s.	4,800	2,800
Clan Cumming ,, s.s.	4,800	2,800
Sabrina, steam yacht	500 y.m.	850

Steamers tripled.	I.H.P.
S.S. Clan Macgregor	2,100
S.S. Clan Mackenzie	2,100

Very much progress has been made in the work of putting down a new electric plant at the Naval Construction Works, with the view of employing electricity as a motive power in the several departments of the works. Experience has proved the great advantages that accrue from the employment of electricity in this way. Current can be carried any distance much more readily than can steam, and economy is greatly in favour of electricity, as the actual H.P. used is smaller than in the case of steam, owing to the fact that steam must be kept up whether the machines are running or not. It is confidently expected that by Christmas the full installation of electricity will be in active operation at the Barrow works, and it is certain then that the shipbuilding and engineering departments in the great concern at Barrow will not only be up to date in regard to the application of electric and other facilities requisite to work the place economically and profitably, but that by the introduction of a vast amount of new machinery, much of it of modern type and for a variety of purposes, and also much of it for labour-saving purposes, the works of Vickers, Sons, & Maxim will be almost unique in their general arrangement and in the completeness of their fittings and tools for the production of the highest class of work.

There has been a general all-round advance in wages at the shipbuilding establishments in the district, and the men's demands have been readily met without murmur. Engineers, boiler makers, iron founders, coppersmiths, brass finishers, pattern makers, and almost every trade has received some advance or other, and the circumstances of trade, the big demand for new tonnage, the huge orders in hand, and the pressure there is for early deliveries, have all tended to make advances in wages reasonable and justifiable; but the chief features of these increases is the amicable way in which they have been conceded. Both masters and men agree this is a time when they must pull together in mutual interests, and make the best harvest that is possible in the good times through which we are passing.

West Cumberland.—There is a very steady and active trade in shipbuilding at Workington and Maryport. Both Messrs. Williamson at the former place and Messrs. Ritson at the latter are well off for orders. They are engaged in the building of small craft for which, along with heavier tonnage, there is at present a very big demand. During the month Messrs. Ritson have launched a new steamer, the *Balmyle*. Her length is 143 ft., breadth, 23 ft. 6 in., and depth of hold 10 ft. She is built of steel and has a capacity of 450 tons. She is going to the Clyde for her engines. No further news is to hand about the proposal to resuscitate the old shipyard at Whitehaven, and fears are entertained that this industry will never return to Whitehaven.

Shipbuilding Material.—There is a very brisk demand for all descriptions of steel shipbuilding material, indeed, the demand exceeds the supply and many makers are compelled to refuse orders. They are very briskly employed night and day, and the maximum of output is being secured with marked regularity. Indeed, the mills in this district have had a run of brisk and satisfactory work for a considerable time past, and it is probable that this will be maintained. Arrangements are in fact in progress whereby the output of the mills at Hindpool, Barrow, will be greatly increased. They require a deal of feeding, and the only way in which to increase the metal they require is to put down additional Siemens-Martin furnaces and additional slabbing mills. This work is being undertaken at present by Mr. J. M. While, the manager of the works, who after all is staying with the Barrow Co., and not going, as he intended to do, to the Ebbw Vale Co., in South Wales. At present, the output in thick and thin plates at the Barrow Steel Works is about 1,200 tons per week. Before long it will reach 2,000 tons per week. The company could readily dispose of this weight of metal, as their works are so conveniently placed in respect to cheap carriage, not only to the Naval Construction Works alongside, but to the shipyards at Liverpool, Belfast, Glasgow, and elsewhere. Heavy plates have gone up in price to £6 15s. per ton, and angles are quoted at £6 10s. There is a very large demand for heavy and light steel castings, and the foundries in the Barrow district are very busy. Great extensions are being made to them at the Barrow Works, as this is one of the most successful and profitable departments of the company's trade. Shipbuilders and marine engineers draw very largely from the foundry department of the Barrow works, and most of the orders in hand, or likely to be accepted, are under Admiralty or Lloyd's tests, the former especially. Prices are very good for heavy castings, and makers have six months orders in hand at least. The coppersmiths, brass moulders and finishers are all very busy, and the various minor works which supply specialities to the shipbuilding companies in the district have all their hands well filled with orders. Prospects look exceedingly bright, and little by little more work is centreing itself in the district, incidental to the minor departments of shipbuilding and marine engineering generally.

Hematites.—The hematite pig iron trade remains very strong and brisk, and orders are decidedly plentiful, indeed, smelters cannot undertake all the contracts that are being offered. Prices consequently keep very high, with mixed Bessemer numbers at 58s. to 59s. net f.o.b., and warrant iron at 59s. net cash sellers, 59s. 6d. one month. Forty furnaces are in blast, as compared with 39 in the corresponding week of last year. Stocks have been reduced since the beginning of the year by 31,881 tons, and now represent 122,586 tons. Makers hold no stocks, and at present cannot increase their output owing mainly to the scarcity of iron ore. An attempt is being made to remedy this defect, and possibly by the end of the year additional furnaces will be put in blast.

Shipping.—Shipping at West Coast ports is very steadily employed, and one growing feature of the exports is that of plates, angles, castings, and sections sent from Barrow to shipbuilders at Belfast, the Clyde, and elsewhere. The total exports of pig iron this year has now reached 455,117 tons, and of steel 458,725 tons, as compared with 383,862 tons of pig iron and 408,209 tons of steel in the corresponding period of last year, an increase of 71,255 tons of pig iron and 50,516 tons of steel.

OBITUARY.

DAVID COLVILLE, STEEL MASTER.

TRADE and industrial circles throughout Glasgow and the West of Scotland heard at the end of October with sincere regret of the demise of Mr. David Colville, senior partner of David Colville & Sons, Dalzell Steel and Iron Works, Motherwell. The deceased, who was in his 86th year, passed away at his residence, Claremont Terrace, Glasgow, on 29th October after a short illness. He was a native of Campbelltown, where he was born in 1813, and in early life he was associated with his father and brother in a cartwright and blacksmith business in Campbelltown, and owned several coasting vessels. In course of time he removed to Glasgow, and shortly afterwards, as principal partner in the firm of Colville & Gray, he erected the Clifton Ironworks, Coatbridge, and entered into the manufacturing iron trade. In 1870 he retired from the Coatbridge works, and established the Dalzell Ironworks in Motherwell. In the following year the coal and iron trades of the country expanded to an unprecedented degree of prosperity. But in process of time it became evident that steel would soon supersede malleable iron for all purposes, and Mr. Colville, foreseeing this, was among the first in Scotland to erect plant for the manufacture of steel on the Siemens process. Exactly ten years after coming to Motherwell he established, in 1880, the Dalzell Steel Works as an adjunct. Since then the development of the works has been phenomenal, and addition followed addition of the most improved description till the works are now by far the largest of the kind in Scotland. The firm have, however, up to the present taken no share in the manufacture of the heavier class of material such as armour and other plating involved in warship construction, although they have more than once been credited with the intention of adding that department to their other work. Contradicting a statement to this effect made recently in the *Financial Times*, the firm in their communication observed that the Scotch steel trade was not solely dependent on Clyde shipbuilding, but that the demand from engineering and bridge building works for boilers, &c., forms as large and as constant an outlet for steel as that on account of shipbuilding plates. The deceased Mr. Colville, being of a retiring disposition, took little part in public life, but was a Commissioner of Supply and a Justice of the Peace for the county of Lanarkshire for over 30 years. He was a strong advocate for total abstinence, was a supporter of the Scottish Temperance League for 50 years, and was held in the highest esteem by all who knew him. He was pre-deceased by his wife in November 1897, and is survived by a numerous family, the eldest son being Mr. John Colville, M.P. for North-East Lanarkshire.

The Clydebank Engineering and Shipbuilding Co., has contracted with the American Line for the construction of two new cargo and passenger steamers each of about 10,000 tons, intended to augment the fleet of "Red Star" liners (Societe, Anonyme, Belge-Americiane) plying between Antwerp and Philadelphia; to all intents and purposes a part of the New York and Southampton American Line. The vessels are to be propelled by twin screws and to be 560 ft. in length. It was first reported that four vessels had been placed with the Clydebank firm and two with Messrs. Hawthorns, Leslie & Co., on the Tyne—six steamers in all, representing a tonnage of 56,000 tons—but this has been contradicted.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Rimu.—On October 14th there was launched at Preston, for Messrs. Ramsay & Sundstrum, of Dunedin, a steel schooner-rigged steamer, named the *Rimu*.

Videro.—On October 22nd there was launched at North Shields a steel steam ketch, of about 180 tons gross, named the *Videro*. She is owned by the White Star Steam Fishing Co., Limited, of Grimsby.

Lowestoft.—On October 26th the *Lowestoft*, a new steel tug, built for the Great Eastern Railway Co.'s service at Lowestoft, was launched by Earle's Shipbuilding & Engineering Co., Limited, from their yard at Hull. She is a twin-screw boat, 105 ft. long, 22 ft. beam, and 9 ft. 6 in. depth of hold, is equipped with powerful fire and salvage apparatus, and has two independent sets of triple compound engines, capable of developing collectively about 550 I.H.P.

Roman Empire.—On October 26th there was launched at Hull an iron steam ketch, of about 182 tons gross, named the *Roman Empire*. She is owned by the Cargill Steam Trawling Co., Limited, Hull.

Mountby.—On Thursday, October 27th, Messrs. Wm. Gray & Co., Limited, launched two large steel screw steamers, the first being for Messrs. R. Ropner & Co., of West Hartlepool. She is built to Lloyd's 100 A1, and her dimensions are:—Length overall, 336 ft.; breadth, 47 ft.; and depth, 24 ft. 10 in. The deck erections consist of a full poop, long bridge, and topgallant forecastle. The saloon and captain's and officer's rooms will be fitted under the poop. The hull is built with web frames and cellular double bottom for water ballast. Five steam winches, steam steering gear amidships, and screw gear aft, patent direct steam windlass, two donkey boilers, grain divisions, stockless anchors, and a complete outfit will be fitted for a first-class cargo boat. Three cylinder triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited. They will develop over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., with large steel boilers constructed for a working pressure of 160 lbs. per square inch. The ceremony of christening the steamer *Mountby* was neatly performed by Master William Guy Ropner.

Miles Coverdale.—On October 27th the second vessel Messrs. Wm. Gray & Co., Limited, launched was the *Miles Coverdale*, which they have built to the order of Messrs. Jno. Coverdale & Son, of West Hartlepool. She will take Lloyd's highest class, and is of the following dimensions, viz.:—Length overall, 312 ft.; breadth, 43 ft.; and depth, 22 ft. 3½ in. She has a full poop bridge and topgallant forecastle with cabin accommodation aft. The hull is framed with deep bulb angle frames, and a cellular double bottom for water ballast, and a full outfit will be fitted, including four steam winches, steam steering gear amidships, and screw gear aft, patent direct steam windlass, two donkey boilers, grain divisions, stockless anchors, &c., and first-class triple-expansion engines by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited. These will develop over 1,000 H.P., and the cylinders are 22 in., 35 in., and 59 in. diameter, with 39 in. stroke of piston and five large steel boilers having a pressure of 170 lbs. per square inch. The construction of the ship and machinery have been under the superintendence of Mr. Airey, on behalf of the owners, and the ceremony of christening the steamer *Miles Coverdale* was gracefully performed by Miss H. Fowler, of Scalby, Scarborough. We may add that Messrs. Wm. Gray & Co., Limited, are building a larger steamer for Messrs. John Coverdale & Son, of West Hartlepool.

Ashmore.—On October 27th Messrs. Wm. Dobson & Co. launched at Low Walker, on Tyne, a steel screw cargo steamer which they have built to the order of the Adam Steamship Co., Limited, of Aberdeen. The length of the vessel is 325 ft., breadth 45 ft., depth 22 ft. 6 in., the deadweight carrying capacity being about 4,600 tons. The machinery is being built by the Wallsend Slipway Co., Limited, and consists of a set of triple-expansion engines, having cylinders 23 in., 37 in., and 61 in. diameter, by 42 in. stroke, steam being supplied by two single-ended boilers at 160 lbs. pressure. The steamer was christened *Ashmore* by Miss Adam, of Newcastle.

Stamfordham.—On October 27th there was successfully launched from the shipbuilding yard of Messrs. Wood, Skinner & Co., Limited, at Bill Quay, Newcastle-on-Tyne, a handsome new steel screw steamer, which has been built to the order of Messrs. Thos. and Wm. Smith, Quayside, Newcastle. The vessel will be registered in the highest class at Lloyd's, under whose survey she has been constructed, and is specially designed for the coal trade, having extra large hatches to obviate the necessity for trimming. Her principal dimensions are as follows:—Length, 217 ft.; breadth, 30 ft.; depth moulded, 16 ft.; with a deadweight carrying capacity of 1,300 tons. She will be equipped with all the most modern improvements to facilitate the rapid loading and discharging of cargo. The steamer is of the raised quarter-deck type, with accommodation for captain and officers amidships, and for the engineers aft, the crew being berthed in topgallant forecastle. She will be fitted with a set of triple-expansion engines of the improved type, having cylinders 17 in., 28 in., and 46 in. diameter respectively, with a stroke of 30 in., steam being supplied by a large steel multitubular boiler working at 160 lb. pressure per square inch. The machinery has been constructed and will be fitted by the North-Eastern Marine Engineering Co., Limited, Wallsend-on-Tyne. As the vessel left the ways she was christened *Stamfordham* by Miss Skinner, of South Shields.

Malang.—On October 28th the s.s. *Malang*, which is being constructed to the order of the Rotterdamsche Lloyd of Rotterdam by Wigham Richardson & Co., Neptune Works, Newcastle-on-Tyne, was successfully launched. The steamer is built of steel, to attain the highest class in the Registry of the Bureau Veritas; she is 333 ft. in length by over 44 ft. beam, and will be fitted up for a limited number of passengers. The engines and boilers are also being constructed by Wigham Richardson & Co., and are designed to drive the vessel at a good speed. The construction of the vessel is proceeding under the superintendence of Mr. J. de Bruyn Kops, of The Hague. The christening ceremony was gracefully performed by Mrs. R. M. Sutton, of Newcastle-on-Tyne, and among the company present was Mr. Anthony Ruys, representing the owners.

Osborne.—On October 28th there was launched from the West Yard of C. S. Swan & Hunter, Limited, a steel screw cargo steamer, built to the order of Messrs. Raeburn & Verel, of Glasgow. Her principal dimensions are:—Length over all, 376 ft.; beam extreme, 48 ft.; and depth, moulded, 29 ft., and she will carry a deadweight cargo of 6,600 tons on a draught of 23 ft. 6 in. She has been built to the spar deck rule, and will take the highest class of the British Corporation. The deck and cargo arrangements are of the latest and best description, a very large number of cargo derricks and winches being supplied, steam windlass and steam steering gear. She has a long forecastle, wherein are berthed the crew and firemen, long bridge for cargo over which in houses accommodation is provided for officers, engineers, and a few passengers, and a long poop aft for cargo. The engines have been built by the Wallsend Slipway & Engineering Co., Limited, and consists of a set of triple-expansion engines having cylinders 26 in., 42 in., and 69 in. diameter, with a stroke of 48 in., the boilers being 14 ft. 3 in. in diameter and 11 ft. 3 in. long, fitted with Howden's system of forced draught, the working pressure being 160 lbs. On leaving the ways the vessel was named the *Osborne* by Mrs. Rettie, the wife of Captain Rettie, who will command the vessel.

Astræa.—On October 28th Messrs. Ropner & Son launched at Stockton-on-Tees a steel screw steamer of the following dimensions:—Length between perpendiculars, 325 ft.; breadth extreme, 48 ft.; and depth moulded, 24 ft. 3 in. The steamer has been built to the order of Sir Christopher Furness, West Hartlepool, for Messrs. Rickinson, Son & Co., of the same port, and is of the three-decked rule, with one deck laid, having the builders' patent "trunk," full poop, bridge, and topgallant forecastle. She will be fitted with a set of triple-expansion engines by Sir Christopher Furness, Westgarth & Co., Limited, having cylinders 24 in., 38 in., and 64 in. in diameter, with a stroke of 42 in., steam being supplied by two steel boilers 15 ft. 3 in. by 10 ft. 3 in., working at a pressure of 160 lb. per square inch. As the steamer left the ways Miss Constance Rickinson, daughter of Mr. John Rickinson, of West Hartlepool, gave her the name of *Astræa*.

Aulaby.—On October 29th Messrs. Cochrane & Cooper, Limited, launched from their Grovehill shipyard, Beverley, a steam trawler of the following dimensions: 115 ft. 4 in. by 21 ft. by 11 ft. 3 in. depth of hold, built to the order of Mr. Jas.

H. Collinson, Hull. Triple-expansion engines will be fitted by Messrs. C. D. Holmes & Co., Hull, and all the latest appliances for trawling will be supplied. Miss Collinson, of Hull, named the vessel s.s. *Aulaby*, and after the ceremony the company adjourned to the offices of the builders where breakfast was provided.

Hutton.—On October 29th there was launched at Whitby by Messrs. T. Turnbull & Son, to the order of Messrs. Pyman Brothers, of London, a steel screw steamer of larger proportions and dimensions than any that has hitherto been launched at Whitby. Her dimensions are:—Length over all, 361 ft. 8 in.; length between perpendiculars, 350 ft.; breadth extreme, 43 ft.; depth to top of ordinary floors, 28 ft. 6¼ in. She is classed 100 A1 at Lloyd's, under spar-deck rule, with poop, bridge, and forecastle. The engines will be fitted by Messrs. Blair & Co., the cylinders being 24 in., 40 in., and 65 in., with a stroke of 42 in. The deadweight carrying capacity is 5,660 tons. The vessel was christened *Hutton* by Miss Connie Pyman, daughter of Mr. W. H. S. Pyman, J.P., C.C.

Ermack.—On October 29th there was launched from the shipyard of Messrs. W. G. Armstrong, Whitworth & Co., Walker-on-Tyne, an icebreaking steamer, said to be the largest in the world, which the firm has built for the Russian Government. The vessel is described as the pioneer ship of what may be termed pelagic icebreakers. The principal dimensions are: Length 350 ft., breadth 71 ft., and depth 42 ft. 6 in. When fully loaded the draught will be 25 ft. and the corresponding displacement about 8,000 tons. The propelling machinery has been divided into four sets, of which three sets are aft, each driving its own propeller, and one set forward. The combined power of these four sets of machinery will be 10,000 H.P. There is accommodation for 30 first-class passengers, 10 second-class, and 50 third-class passengers, besides that for the captain, officers, engineers and crew of the vessel. There is ample capacity for cargo, so that the vessel, in addition to convoying merchant vessels through the ice, is herself capable of carrying a heavy cargo. The stern of the icebreaker is cut to form a recess, into which the stem of another vessel can be securely lashed, and thus obtain the utmost protection from her powerful consort. Admiral Makaroff has also in view the possibility of augmenting the icebreaking capabilities of this vessel by having the assistance of a second vessel pushing her, as to which he has already made experiments. The launching ceremony was performed by Mme. Vasilieff, who gave her the name *Ermack*. Mme. Vasilieff is the wife of Captain Vasilieff, I.R.N., who will command the *Ermack*.

Louise.—On October 29th Messrs. Bartram & Sons launched at Sunderland, for Mr. Carl Hirschberg, of Hamburg, a large steel screw steamer of the spar-deck type, and of the following dimensions:—Length, 350 ft.; breadth, 45 ft.; depth, 26 ft. 9 in.: gross tonnage about 3,400 tons, and carrying capacity of about 5,500 tons. She has been built to take the highest class in Lloyd's Registry. The propelling machinery will be supplied by Messrs. Dickinson & Sons, Limited, Monkwearmouth, the cylinders being 24 in., 39½ in., and 65 in., with a stroke of 42 in. The vessel was named *Louise*.

Cargo Steamer.—On October 31st there was launched from the Southwick yard of Messrs. Robert Thompson & Sons, a finely modelled first-class cargo steamer, for Messrs. F. Leyland & Co., Limited, Liverpool. The length is between perpendiculars, 351 ft. 6 in.; breadth, 42 ft. 3 in.; and depth, moulded, 26 ft. She is built to Lloyd's 100 A1 three-deck rules; with poop, long bridge, and topgallant forecastle, having cellular bottom peaks for water ballast. The tanks are divided longitudinally for trimming purposes, the holds being divided by seven water-tight bulkheads, with six powerful steam winches for working the cargo from the five holds and extra strong double derricks to each hold. The steam steering engine is placed aft, inside the poop, with control shafting under beams to the wheelhouse on the bridge. The vessel has been specially designed to carry a large cargo on a light draught, with extra strength to keel for lying aground. The accommodation for captain and officers is on the bridge deck forward, the engineers' berths being at the after end, and the crew are provided for in the forecastle. The engines are by Messrs. Thomas Richardson & Sons, of West Hartlepool, the cylinders being 22 in., 36 in. and 62 in. by 48 in. stroke, with extra large boilers. During construction the machinery has been superintended by Mr. Neville Evans, and the hull by Captain Fry.

Albanian.—On October 31st Messrs. Robert Thompson & Sons launched at Sunderland a first-class cargo steamer, built to the order of Messrs. F. Leyland & Co., Limited, Liverpool. Her dimensions are:—Length between perpendiculars, 351 ft. 6 in.; breadth, 42 ft. 6 in.; and depth, moulded, 26 ft. She is built to Lloyd's 100 A1 three-deck rules, with poop, long bridge, and topgallant forecastle, having cellular bottom and peaks for water ballast. The tanks are divided longitudinally for trimming purposes, the holds being divided by seven water tight bulkheads. The engines are by Messrs. Thomas Richardson & Sons, of West Hartlepool, the cylinders being 22 in., 36 in., and 62 in. in diameter, with a stroke of 48 in., steam being supplied from extra large boilers. The vessel was named *Albanian*.

Palatinia.—On Tuesday, November 1st, Messrs. Furness, Withy & Co, Limited, launched from the Middleton shipyard, West Hartlepool, a large steel screw steamer built for Messrs. Sivewright, Bacon & Co, to the order of Messrs. The Manchester & Salford Steamship Co., Limited. The vessel has a clipper stem and is rigged with four masts specially designed for the Manchester Ship Canal trade. She is a very substantial type of a modern cargo boat, measuring over 350 ft. in length and is built throughout of Siemens-Martin steel with a large measurement and deadweight carrying capacity and built to the highest class under British Corporation classification, and is practically a copy of the *Lincluden* type of vessel introduced by Messrs. Furness, Withy & Co., which has proved so successful. Every care has been taken in designing this ship to construct her as substantial as possible for the heavy deadweight trade. She is built on the deep frame principle with cellular double bottom for water ballast all fore-and-aft and subdivided at intervals, the after peak being also available as a tank. To further ensure the safety of the vessel the main and fore holds are each divided in the middle by steel watertight bulkheads, these bulkheads being efficiently stiffened by an iron longitudinal division. With the extra amount of subdivision in holds and water ballast tanks and the efficient way in which the pumping gear is arranged, the vessel is practically unsinkable by collision or stranding. To obtain as much strength as possible the greater portion of the shell plating is in 24 ft. and 36 ft. lengths, this plating being efficiently backed up by strong deep framing carried up to main deck all fore-and-aft. The bottom plating is also thicker in way of all ballast tanks to permit the vessel to lie aground whilst taking in cargo. To allow for corrosion the whole of the weather deck, tank top, floor plates, &c., are of extra thickness, there being practically no thin steel in the ship. She has extra large sized hatches which will take the bulkiest cargo, and would be specially suitable for carrying machinery, large guns, torpedo boats, &c. The auxiliary machinery for working the cargo is of the most efficient description; six large winches to hatches, patent steam steering gear amidships with hand gear aft, steam windlass, and anchors of the stockless pattern are fitted. The machinery has been constructed by Messrs. T. Richardson & Sons, Limited, Hartlepool, the engines being of the triple-expansion type with three large steel boilers. Every provision has been made in designing the machinery for economy of fuel and a minimum cost of up-keep. The vessel with all her up-to-date improvements will be a valuable addition to the fleet of Messrs. The Manchester & Salford Steamship Co., Limited. On leaving the ways the ceremony of christening the vessel *Palatinia* was gracefully performed by Mrs. G. W. Sivewright Hartlepool.

Shikishima.—On November 1st there was launched from the Thames Ironworks and Shipbuilding Co.'s yard, Blackwall, the battleship *Shikishima*, built for the Japanese Government. The vessel is the heaviest vessel ever launched from a slip, her total launching weight being 8,250 tons, of which 7,800 tons represent the weight of the hull, the remainder consisting of the launching cradles. It is stated that when complete she will be the most powerful vessel afloat, her displacement will be 14,850 tons, and will carry 700 tons of coal only. This allows her 150 tons more weight in the hull, engines, and armament, and this difference has been used in providing, first, a complete armour belt on the water-line from stem to stern, whereas in the *Majestic* class the belt extends only between the barbettes; and secondly, two additional six-inch quick-firing guns. Her length over all is 438 ft., and between perpendiculars 400 ft.; her extreme breadth is 75 ft. 6 in.; her depth from top of keel to upper deck, 45 ft. 2½ in.; her mean draught of water 27 ft. 6 in.;

and her displacement to that draught, 14,850 tons. The engines, which are of 14,500 H.P., and have cylinders 34 in., 53 in., and 84 in. diameter for high, intermediate, and low pressure respectively, with a piston stroke of 4 ft., the cylinders being each carried independently by cast iron supporting columns at the back, and forged steel columns in front, the crank shaft-bearing brackets by which the columns are carried being of cast steel, are constructed by Messrs. Humphreys, Tennant & Co. The vessel is to be provided with 25 water-tube boilers of the latest improved Belleville type, and her speed is to be 18 knots.

Goole No. 4.—On November 1st there was launched from the building yard of Messrs. J. P. Rennoldson & Sons, South Shields, a steel screw tug 75 ft. by 15 ft. by 7 ft., specially built for river towing. The engines, also made by the builders, are of the compound surface condensing type, with cylinders 12 in. and 24 in. by 18 in. stroke; 125 lbs. working pressure. The tug has been built to the order of the Goole and Hull Steam Towing Co., Limited, of Goole, and was named *Goole No. 4* by Mrs. Buck, wife of one of the directors.

Sylvia.—On November 3rd Messrs. Cochrane & Cooper, Limited, launched from their Grovehill shipyard, Beverley, a steam trawler of the following dimensions: 117 ft. 6 in. by 21 ft. 6 in. by 11 ft. 6 in. depth of hold built to the order of Mr. G. T. Armitage, Hull. Engines of triple-expansion type are being fitted by Messrs. C. D. Holmes & Co, and the vessel will be complete with the latest appliances for trawling. Mrs. G. T. Armitage named the vessel the *Sylvia*, and after the ceremony the company adjourned to the offices of the builders where luncheon was provided.

Vulcan, Conqueror, and Uriel.—On November 10th Earle's Shipbuilding Co. launched at Hull, for the Atlas Steam Fishing Co., Limited, the Anchor Steam Fishing Co., Limited, and the Grimsby Union Steam Fishing Co., Limited, three steam trawlers—the *Vulcan*, *Conqueror*, and *Uriel*—each 115 ft. in length.

Broadgarth.—On November 14th Messrs. R. Craggs & Sons launched from the Tees Shipyard the steel steamer *Broadgarth*, built to the order of the Clapham Steamship Co., Limited, for their general trade. She is of the following dimensions:—Length 330 ft., breadth 47 ft., depth moulded 26 ft. 4 in. She is of the new single deck type. On leaving the ways she was named by Miss Macarthy, the daughter of Mr. G. E. Macarthy, the managing director of the Clapham Steamship Co., Limited, and the vessel is now taking in her machinery at the works of the North Eastern Marine Engineering Co., Ltd., at Wallsend-on-Tyne.

Abergeldie.—On Monday, November 14th, there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a steel screw steamer, 356 ft. between perpendiculars, by 45 ft. 2 in. broad, by 29 ft. 4 in. deep, having poop, bridge and topgallant forecastle, classed 100 A1 Lloyds under special survey, spar deck grade. The vessel is built on the deep frame system, thus dispensing with hold beams, and leaving a clear space for the stowage of general cargo. Accommodation is placed on the bridge for captain, officers and engineers, as well as the spare berths. The main saloon is in the same position, and fitted up tastefully in polished oak. The poop and the whole of the bridge are arranged for cargo. Accommodation for sailors and firemen is in the forecastle as usual. Electric installation will be fitted throughout by Messrs. Falconer & Cross, of Newcastle, ample arrangements being made for discharging of cargo by night. The steam steering gear is by Messrs. Alley & MacLellan, of Glasgow, direct steam windlass by Messrs. Emerson, Walker, & Thompson, Newcastle, and steam winches by Mr. Robert Welford, Sunderland. Double derricks are fitted. The main engines are by the North-Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 25 in., 41½ in., and 69 in. by 45 in. stroke, steam being supplied by two large boilers working at a pressure of 175 lbs. per square inch. The vessel has been built to the order of the Adam Steamship Co., Limited, of Aberdeen, and upon leaving the ways was gracefully named *Abergeldie* by Mrs. Stanley Manford, daughter of Mr. J. B. Adam, of Newcastle.

Wimborne.—On Monday afternoon, November 14th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions, viz.:—Length over all, 351 ft.; breadth extreme, 46 ft.; depth moulded, 27 ft. 3 in.; tonnage gross about 3,490 tons. This vessel, which has been built to the order of Messrs. Evan Thomas Radcliffe & Co., Cardiff, will class 100 A1 on Lloyds' Register, and has been built under special survey. She is of the three-deck type, with one deck laid, having poop, long bridge, and topgallant forecastle. Accommodation for captain, officers and passengers is provided in poop, engineers being berthed in iron houses on bridge deck, and crew in topgallant forecastle. A cellular double-bottom, fore and aft, and fore and aft peak tanks are fitted for water ballast, and equipment includes six steam winches, large horizontal donkey boiler, steam windlass, stockless anchors, steam steering gear, &c., &c. The engines by Messrs. Blair & Co. have cylinders 24 in., 40 in., and 65 in. by 42 in. stroke, steam being supplied by two single-ended boilers of 160 lbs. pressure. As the vessel left the ways she was named *Wimborne*.

Veria.—On November 15th a new steamer for the Cunard Line was launched from the Walker Shipyard of Sir W. G. Armstrong, Whitworth & Co. The principal dimensions of the vessel are:—Length 340 ft., breadth 45 ft. 3 in., depth 27 ft. 3 in. She is built to Lloyd's requirements for their highest classification under special survey, and also complies with the Board of Trade regulations. The deadweight will be about 5,000 tons, and the speed about 11 knots. The vessel is of the spar deck type, and has a poop, a bridge, and a topgallant forecastle. The vessel was christened *Veria* by Miss Swan, of North Jesmond.

Wakanui.—On November 15th Messrs. R. and W. Hawthorn, Leslie & Co., Limited, Hebburn-on-Tyne, launched a steamer 420 ft. by 54 ft. by 32 ft., built to the order of the New Zealand Shipping Co., of London, for their Australasian trade. The vessel is specially fitted for carrying frozen meat, with powerful duplicate refrigerating machinery. The machinery consists of a set of triple expansion engines, capable of indicating upwards of 3,000 I.H.P., with three large single-ended steel boilers, working at a pressure of 160 lb. per square inch, worked with forced draught. The vessel was christened the *Wakanui*.

Athena.—On November 15th Messrs. Short Brothers launched from their works a fine-modelled vessel built to the order of Messrs. W. Lowden & Co., of Liverpool. The vessel has been built of steel under special survey to the highest class in Lloyd's Registry, and is of the following dimensions, viz.:—Length, 352 ft.; breadth, 45 ft.; depth moulded, 27 ft. 9 in., the carrying capacity being 5,800 tons deadweight. Special attention has been given to the arrangement of the upper and main decks, so as to enable a large number of cattle to be carried, suitable ventilation, &c., being fitted. The erections on deck consist of full poop, long bridge amidships, and topgallant forecastle, the saloon, captain's, officers', and engineers' accommodation being fitted in commodious houses on the bridge deck, with chart and wheel-house on the flying bridge. The steam steering gear is fitted in engine room with controlling rods from wheel-house on flying bridge. The double-bottom is constructed on the cellular system, sub-divided into trimming tanks for water ballast. The holds are four in number, powerful steam winches being fitted, steam for which is supplied by a large multitubular donkey boiler placed in the stokehold. She is fitted with all the latest appliances for the economical and quick loading and discharging of cargoes, including an electric light installation. The vessel will be supplied with triple-expansion engines by Messrs. George Clark, Limited, Sunderland, having cylinders 24½ in., 40 in., 66 in. diameter with a stroke of 45 in., steam being supplied by two large boilers working at 180 lbs. pressure, fitted with Howden's forced draught, and all recent improvements for the economical working of the engines. On leaving the ways the vessel was named *Athena*, the ceremony of christening being gracefully performed by Mrs. Connell, of Liverpool.

Pendeen.—On Tuesday, November 15th, Messrs. Wm. Gray & Co., Limited, launched the fine steel screw steamer *Pendeen* to the order of Mr. Richard B. Chellew, of Truro. The vessel will take Lloyd's highest class, and her dimensions are:—Length, overall, 300 ft.; breadth, 42 ft., and depth, 21 ft. 9 in. She has a full poop, long bridge, and topgallant forecastle joined by fore and aft gangways, tasteful saloon and cabins for officers, etc., will be fitted up aft, the engineers' rooms are in the bridge, and the crew's accommodation forward. The hull is built on the web frame system with a cellular double bottom, large aft peak tanks, large hatchways, four steam winches, steam steering gear amidships, hand screw gear aft, large patent donkey boiler, patent direct steam windlass, boats on beams overhead, iron grain divisions, stockless anchors, two masts with schooner rig, and a complete outfit for a first-class cargo vessel. The Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, supply fine triple-expansion engines of 1,000 H.P., having cylinders 21½ in., 35 in., and 58 in. diameter with a 39 in. piston stroke, and two large steel boilers to work 160 lbs pressure per square inch. The vessel has been built under the superintendence of Mr. Jno. Chellew and Captain Thos. Christopher and the ceremony of christening the steamer *Pendeen* was gracefully performed by Mrs. W. C. Gray of Staincliffe, Seaton Carew. The *Pendeen* is the sixth ship built by Messrs. Wm. Gray & Co., Limited, for Mr. Richard B. Chellew.

Sirdar.—On Tuesday, November 15th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne a steel screw steamer built to the order of Messrs. Stephens & Mawson, of Newcastle-on-Tyne. And is of the following dimensions viz:—Length, 335 ft. breadth, 48 ft.; depth, 27 ft. 3 in., moulded and to class 100 A1 at Lloyd's on the single decked rule. This vessel has water ballast fitted right fore and aft on the cellular system and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including five double cylindered steam winches, direct acting steam windlass, large donkey boiler, steam steering gear by Messrs. Clarke, Chapman & Co., Limited (Scott's Patent), and Hastie's screw gear aft. The engines which are to be supplied by Messrs. the Wallsend Slipway & Engineering Co., Limited, are of the triple-expansion type having cylinders 24 in., 39 in., and 66 in. by 45 in stroke and working at a pressure of 180 lbs. On leaving the ways the vessel was named the *Sirdar* by Miss Florrie Stephens, of Ravenstone, Corbridge.

Kronberg.—On Wednesday, November 16th, Messrs. Wm. Gray & Co., Limited, launched a large steel screw steamer to the order of Mr. C. K. Hansen, of Copenhagen. She will take the highest class in Lloyd's, and is of the following dimensions, viz.:—Length, over all, 341 ft; breadth, 47 ft.; depth, 27 ft. 4 in., with large bridge, poop, and topgallant forecastle. The saloon, state rooms, captain's room, &c., will be fitted up in a large deck house amidships, the officers' and engineers' accommodation will also be on the bridge deck, and the crew's berths in the forecastle. The hull is built with deep frames, large hatchways are fitted, six steam winches, steam steering gear amidships, and screw gear aft, patent direct steam windlass, two donkey boilers, cellular double bottom for water ballast, shifting boards throughout, stockless anchors, telescopic masts, with fore and aft rigs, boats on beams overhead, and all requirements for a first-class cargo steamer. Triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, having cylinders 25 in., 40 in., and 65 in. diameter, with a piston stroke of 42 in., and large steel boilers for a working pressure of 160 lbs. per square inch. The ceremony of naming the vessel *Kronborg* was gracefully performed by Mrs. George Jones, of West Hartlepool.

Salvo.—On November 16th there was launched by Messrs. Eltringham & Co., at South Shields, a twin screw tug, built to the order of Messrs. Thomas Wilson, Sons & Co., of the well-known Wilson Line. The vessel is 127 ft. long over all, and has two sets of triple-expansion engines by Mr. Geo. T. Grey, and supplied with steam by two large steel boilers working at a pressure of 200 lb. per square inch. Besides being built for towing, the vessel is intended to act as a first-class tender on Messrs. Wilson's passenger carrying liners, and was named *Salvo*.

Valiant.—On November 19th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel screw tug of the following dimensions, viz.:—Length, over all, 80 ft.; beam, moulded, 17 ft. 6 in.; depth, moulded, 9 ft. She was launched by Messrs. J. H. Palmer, and christened *Valiant* by Mrs. Scarr. The tug was built of steel throughout, and to the order of Joseph Constant, Esq., London, and is to take Lloyd's highest class for tug purposes. She is designed specially for deep sea towing, with a shelter deck full length of boiler casing.

LAUNCHES.—Scotch.

Mormond.—On October 27th Messrs. Hall, Russell & Co. launched at Aberdeen the steam screw trawler *Mormond*, built to the order of the Fraserburgh and North of Scotland Steam Trawling Co., Limited, Fraserburgh. This vessel is the first of a fleet of seven, four of which are being built by Messrs. Hall, Russell & Co., and three by Messrs John Duthie, Sons & Co. She is 118 ft. long, 21 ft. broad, and 11 ft. 7 in. deep, her gross tonnage being 180. She is classed A1 at Lloyd's. Triple-expansion engines of 38 I.H.P. will be fitted.

Fashoda.—On October 29th Messrs. John Reid & Co., Limited, launched from their shipbuilding yard at Whiteinch-on-the-Clyde the first of two steel screw cargo steamers they are building for Messrs. Maclay & M'Intyre, of Glasgow. The vessel is about 320 ft. between perpendiculars, by 46 ft. beam, by 23 ft. 9 in. moulded depth, and is to carry about 4,580 tons on a light draft of water. Accommodation for the officers, as is the case in nearly all the later vessels, is contained in a steel house built on the top of bridge deck, the crew being berthed in topgallant forecastle. She has a poop, long bridge, and topgallant forecastle, and is fitted with steam windlass and steam steering gear and all the latest appliances for loading and discharging cargo, including five powerful steam winches, which receive their steam from a large horizontal multitubular donkey boiler. The machinery, which is being supplied by Messrs. Alexander Stephen & Sons, of Linthouse, consists of one set triple-expansion engines, having cylinders 22½ in., 36½ in., and 60 in. by 39 in. stroke, with two large boilers, having a working pressure of 160 lb. The vessel was christened *Fashoda* by Mrs. Daniel Shields, Dunclutha, Dalmuir. Immediately after the launch the vessel was towed to the Prince's Dock, where she is to get her machinery fitted.

Foreric.—On October 29th Messrs. Russell & Co., Port-Glasgow, launched the steel screw spar-decked steamer *Foreric*, to the order of Messrs. Andrew Weir & Co., Glasgow. Dimensions:—Length, 345 ft.; breadth, 49 ft. 9 in.; depth, 28 ft. 5 in. This vessel is built to Lloyd's highest requirements, and will carry about [illegible],250 tons on Board of Trade freeboard. Construction of the vessel was superintended by Captain Auld, on behalf of the owners, and Mr. Robert Morton, Glasgow, superintended the machinery department. The engines will be supplied by Messrs. Rankin & Blackmore, Greenock

Shrewsbury.—On October 31st Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel screw steamer of about 2,100 tons net register tonnage and 3,400 tons gross tonnage, and to carry 5,400 tons deadweight, for Messrs. Galbraith, Pembroke & Co., London. The vessel is intended for their Eastern and general trade. The following are the principal dimensions:—Length between perpendiculars, 330 ft.; breadth, 45 ft. 6 in.: depth, moulded to spar deck, 26 ft. 6 in. The vessel has been built to the highest class at Lloyd's on the deep frame system. The deck and cargo arrangements are of the latest and best description, a large number of cargo derricks and winches being fitted, along with direct steam windlass and Alley & Maclellan's horizontal steam steering gear. Shifting boards are fitted and hatchways are arranged as grain feeders in accordance with the Act of Parliament for carriage of grain in bulk. The vessel has topgallant forecastle, under which the crew are accommodated, long bridge and poop for cargo. The accommodation for captain, officers, engineers, and a few first-class passengers is provided for in houses on the top of bridge deck and is of the most complete description. The machinery, which is being supplied by Messrs. David Rowan & Son, Glasgow, is on the triple-expansion system. The cylinders are 24 in., 40 in., and 65 in. diameter by 42 in. stroke, steam being supplied by two large boilers working at 180 lb. pressure. As the vessel left the ways she was gracefully named the *Shrewsbury* by Mrs. George Peat, Langlands, Uddingston. The owners were represented at the launch by Mr. Lester Clark, of Messrs. Clark & Aiton, of Glasgow and London, who have superintended the construction of hull and machinery, and Captain Brophy, who is to command the vessel. Immediately after the launch, which was most successful, the vessel was towed to Glasgow to receive her machinery. Messrs. Hamilton have in hand for the same owners a sister vessel to the *Shrewsbury*, which is to be named *Winchester*.

Falching.—On November 1st Messrs. David J. Dunlop & Co., engineers and shipbuilders, Inch Works, Port Glasgow, launched from their works a steel spar-deck screw steamer of the following dimensions, viz—Length between perpendiculars, 280 ft.; breadth moulded, 38 ft.; depth moulded to main deck, 18 ft., and depth moulded to spar deck, 25 ft. This vessel which is to be classed 100 A1 in Lloyd's Registry, has been built to the order of the Douglas Steamship Co., Limited, for their special cargo and passenger trade at Hong Kong, and forms the largest and most modern addition to their fleet. The builders are fitting on board triple-expansion engines of their own design, the cylinders being 22 in., 35 in., and 57 in. diameter by 39 in. stroke, with two large single-ended boilers, together with an auxiliary boiler for deck and other machinery. During construction the steamer has been under the direct and constant superintendence of Mr. W. F. McIntosh. The owners were represented at the launch by Captain R. E. Baker, and as the vessel left the ways she was gracefully named *Haiching*, by Mrs. Baker.

Papanui.—On November 1st there was launched from the yard of Messrs. William Denny & Brothers, at Dumbarton, a steel screw steamer named the *Papanui*, built for the New Zealand Shipping Co., London. Her principal dimensions are: Length, over all, 445 ft.; breadth, moulded, 54 ft.; depth, 41 ft. to shelter deck. She has been built to the highest class in the British Corporation, and the details of the construction of the hull have received the most careful consideration of the builders, and of the Corporation. To obtain the maximum of strength with the minimum of weight, the poop bridge and forecastle have been joined, and the deck thus formed has been made the strength deck. She has been built with "massed" frame, this dispensing with the necessity of hold beams. The ordinary round pillars have been dispensed with, and built pillars and deck runners substituted. These and other details of construction have given a vessel strong in every part and with the minimum of obstruction in the handling of cargo. She has three complete decks. Amidships she has a long deck-house containing the accommodation for passengers, first and second class, with the dining-saloons at each end. Above this house there is the promenade deck with first and second-class smoking-room and first class music-room. These houses are situated at the centre line and leave a large promenade at each side. This promenade is entirely covered by the light deck overhead which has been fitted for carrying the boats. The state-rooms, in which there is accommodation for 41 first-class, and 40 second-class passengers, are large and airy, and fitted up in the builders best style. The officers are berthed in a house forward on the shelter-deck and the engineers in a deck-house aft. Right aft there is a large deck house covering the steering gear, and which also contains the third-class companion. Provision has been made on the upper deck aft, for a large number of third-class passengers. The crew and firemen are berthed on the upper deck forward. The deck and cargo arrangements are of the latest and best description. In addition to a large number of steam winches, she has two steam cranes, steam windlass and steam steering gear. The rudder is of the most approved type, the arrangement of pintles and bearing arms being the patent of Captain Lawson, the marine superintendent of the company. The vessel, being intended to carry frozen meat for the Colonies, has been fitted in the three forward holds with refrigerating apparatus on the Linde system. These holds up to the upper deck have been insulated and fitted with trunk leading to the refrigerating engines which are situated between Nos. 2 and 3 hatches on the upper deck. The vessel has two masts and is schooner-rigged with yard on the foremast. The engines have been built by Messrs. Denny & Co., and consist of a set of triple-expansion engines and three boilers fitted with Howden's system of forced draught. The vessel has been constructed under the supervision of Captain Lawson, marine superintendent, and Mr. Relf, superintendent engineer, with Mr. Black, who will be chief engineer, as resident superintendent. The vessel is in an advanced state of completion, and is expected to leave for New Zealand early in December.

Canadia.—On November 5th Messrs. Archibald M'Millan & Son, Limited, Dockyard, Dumbarton, launched the steamer *Canadia*, which has been built for the Copenhagen Steamship Co. of Copenhagen. Her moulded dimensions are 375 ft. by 48 ft. 6 in. by 29 ft., with a carrying capacity of 6,800 tons. The vessel and machinery have been built to Lloyd's highest class. The ceremony of naming the vessel was performed by Miss Christina Gray, Whitehall, Pollokshields.

Svend Haug.—On November 5th there was lauuched from the yard of Messrs. S. McKnight and Co., Limited, Ayr, a handsome screw steamer for Norwegian owners, for general trade between this country and Norway. The dimensions are 180 ft. by 29 ft. by 13 ft. moulded. The steamer has been constructed of mild steel to the highest class of the Norwegian Veritas under special survey of the local surveyor, Mr. J. Moir, and will proceed to Glasgow to take on board her machinery. As the vessel left the ways she was gracefully christened by Madame Eckersberg with the words "*Svend Haug*, float safely, for the credit of the builders and the owners' profit." The vessel has been constructed under the personal supervision of Captain Eckersberg, the owner's superintendent.

Poseidon.—On November 15th the Grangemouth Dockyard Co. launched from their yard at Grangemouth, an ice-breaking steamer built to the order of the Poseidon Steamship Co., of Abo, Finland. This vessel presents several points of interest, incidental to her intended service in ice-bound waters. The stem has been specially designed and strengthened for breaking up great thicknesses of ice. The stern, of the gunboat pattern, overhanging and protecting the rudder, is provided with a cast steel cutting edge where it enters the water, and the rudder is a steel casting of great strength, and weighing several tons. These castings have been manufactured by the Steel Co. of Scotland, and they are so designed as to enable the vessel to break up thick fields of ice as readily going astern as going ahead. The propeller being subject to concussion with the floating blocks of ice, is of nickel steel the toughest and most tenacious alloy known. Internally the vessel has been strengthened to resist the heavy shocks met with in breaking the ice, and her scantlings, particularly at the fore and aft ends, are enormously in excess of those required for an ordinary vessel of this size. In the machinery department are introduced a number of special arrangements suggested by the experience of the company such as devices for the prevention of freezing in the intense cold of the regions where this vessel will ply, and strengthening the requisite parts to resist the shocks met with by the propeller. The vessel will be classed 100 A1 at Lloyd's under special survey, and her dimensions are 180 ft. by 28 ft. by 21 ft. to awning deck. Accommodation is provided on main deck for officers, engineers, and crew. On the awning deck is fitted a large deck-house for a number of first-class passengers (tastefully fitted up). A powerful searchlight will be fitted with a complete installation of electric light. The vessel will be heated throughout with a special system of steam heating pipes, and be fitted with steam steering gear, quick warping steam windlass, and three powerful steam winches fitted in conjunction with Tait's patent derricks. Triple-expansion engines of large power, with two marine type boilers, working at 160 lbs. pressure, will be provided by Messrs. Cooper & Greig, Dundee. The construction of the hull and machinery has been superintended by Captain Eriksson, who represented the owners at the launch, and who will afterwards take command of the vessel. As she left the ways, she was gracefully named *Poseidon* by Mrs. Jackson, Avoca, Grangemouth.

Harold.—On November 15th Messrs. John Fullerton & Co. launched at Paisley, a steel screw steamer of 320 tons, which they have built to the order of Mr. T. G. Best, Liverpool, for his general carrying trade, and for which the steamer has been specially designed, being very largely in excess of Lloyd's highest class. Compound engines of 450 I.H.P. are to be fitted by Messrs. Ross & Duncan, Govan. The steamer was named *Harold* by Miss Letty Best, Wavertree, Liverpool, daughter of the owner.

Holland III.—On November 15th a finely-modelled steam trawler, built to the order of the Naamlooze Vennovtschap Steam Trawling Co., Holland, was launched by Messrs. John Duthie, Sons & Co., Aberdeen. The vessel is 117 ft. 6 in. in length, 20 ft. 9 in. in breadth, and 11 ft. 6 in. depth of hold. She has gross tonnage of 170 tons and was named the *Holland III.*

Brunswick.—On November 17th there was launched from the shipyard of Messrs. Murdoch & Murray, Port-Glasgow, a steel screw steamer of the following dimensions:—Length 200 ft. by 37 ft. 6 in. by 15 ft. 6 in. moulded. The vessel has been built to the order of Messrs. John Bacon, Limited, Liverpool, and is intended for their Liverpool and Bristol Channel traffic. On leaving the ways the vessel was named *Brunswick* by Miss Matheson, Liverpool, daughter of W. A. Matheson, Esq., chairman of the company. Triple-expansion engines of large power will be supplied by Messrs. Hutson & Son, Glasgow. The vessel and engines have been constructed under the superintendence of Mr. Chris. Geddes, of Liverpool.

Ludvig Peyron.—On November 19th, Messrs. Carmichael, Maclean & Co., shipbuilders, Greenock, launched from their shipbuilding yard a steel screw steamer, built to the order of the Rederi Aktiebolag Co., Stockholm, of the following dimensions :—Length, between perpendiculars, 236 ft.; breadth, moulded, 36 ft.; depth, moulded, 20 ft. 8 in. The gross tonnage is 1,400 tons, and the vessel has been designed to carry a deadweight of 1,700 tons on light draught. The vessel has been constructed to Lloyd's highest class, on the web-frame principle, with cellular double bottom all fore and aft, with poop, bridge, and topgallant forecastle, and has passenger accommodation in the bridge amidships, and large deck-house on top of bridge, which is fitted up in first-class style. The vessel will be furnished with all modern appliances for the quick working of cargo, steam windlass, steam warping capstan aft on poop, and will be fitted with electric light throughout. The engines, which will be supplied by Messrs. Muir & Houston, are triple-expansion. The vessel was named the *Ludvig Peyron* by Miss Eliza Lambie, of Ibrox, Glasgow.

Dunscore and Dunrowan.—On November 23rd Messrs. J. M'Arthur & Co., launched from their shipbuilding yard at Paisley, two steel screw steamers, named the *Dunscore* and *Dunrowan*, which, with other two steamers nearing completion, have been built to the order of Messrs. Paton & Hendry, St. Enoch Square, Glasgow. These steamers have been specially designed and built for the coasting trade, and are exceptionally strong and well-equipped vessels, being built in excess of Lloyd's 100 A1 requirements, to permit of loading and discharging on ground. They are fitted with all the latest and best appliances for expeditious and safe handling of vessel and cargo. Powerful compound surface-condensing engines to drive steamers at a high speed are being fitted by Messrs. Bow, M'Lachlan & Co., Paisley.

LAUNCH.—IRISH.

Afric.—On November 16th Messrs. Harland & Wolff launched at Belfast the *Afric*, a cargo steamer, for the White Star Line. The new vessel is 550 ft. long, 63 ft. broad, and 44 ft. deep. Her gross register is 12,000 tons, and her displacement will exceed 20,000 tons.

TRIAL TRIPS.

Thirlby.—On October 24th the s.s. *Thirlby*, built by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of Messrs. R. Ropner & Co., West Hartlepool, made her official trial trip in the Tees Bay. The vessel is of the partial awning-deck type, having poop and raised quarter deck. Her deadweight carrying capacity is 2,750 tons on about 17 ft. The saloon and cabins for the captain and officers are fitted in the poop, whilst the engineers are provided for in iron houses placed on the awning deck. The vessel is built with deep frames, leaving the holds entirely free for cargo, and is fitted with cellular bottom for water ballast. All labour-saving appliances have been adopted in the vessel's outfit for the economical working of cargoes. She has steam steering gear, powerful steam winches, two large donkey boilers, patent windlass, stockless anchors, &c., and is otherwise fully equipped. The engines are by Messrs. Blair & Co., Limited, and will work up to about 700 effective H.P., the working pressure being 160 lbs. The trial trip proved exceedingly satisfactory, all the machinery working very efficiently. The owners were represented by Mr. Rooke, one of their superintending surveyors, who was highly satisfied with the results of the trial. After adjustment of compasses the steamer left on her run round to the Bristol Channel, where she will load for the Danube.

Italiana.—On October 24th the s.s. *Italiana*, built by Robert Duncan & Co., Limited, of Port-Glasgow, for the British Maritime Trust of London, to the order of Sir Christopher Furness, West Hartlepool, went on her trial trip on the Clyde during very stormy weather, but notwithstanding this the speed attained was 12 knots on the measured mile, which was considered highly satisfactory. The vessel is 305 ft. by 44 ft. by 25 ft. moulded, and carries about 4,400 tons on 21 ft., and has triple-expansion engines by Hall-Brown, Buttery & Co., Govan; cylinders 22½ in., 37 in., 61 in., by 42 in. stroke; two boilers, 14 ft. 3 in. by 10 ft. 6 in., 160 lbs. pressure; four steam winches, and is fitted with all the most modern improvements for the efficient handling of all kinds of cargoes. The vessel, after her trial trip, proceeded to Glasgow to load for Galveston, where she will receive a cargo of cotton and grain for Manchester.

Mokoia.—On October 25th the trial trip of the single screw steamer *Mokoia*, which has been built by Messrs. William Denny & Brothers, Dumbarton, for the Union Steamship Co., New Zealand, took place on the Clyde. The *Mokoia* has a gross tonnage of 5,300 tons, and measures 330 ft. long, 43 ft. broad, and 32 ft. 6 in. deep. With 1,000 tons deadweight on board the vessel has a guaranteed speed of 15¼ knots. On her trial she, however, improved on this, attaining a speed of over 16 knots. The vessel is built of steel, according to the British Corporation rules; and the engines, which were constructed by Messrs. Denny & Co., Dumbarton, are of the direct-acting surface triple-expansion type. There are three cylinders, one high pressure, 28 in. in diameter; one intermediate, 44½ in.; and one low pressure, 70 in., each with piston stroke of 4½ ft. There are three cylindrical single-ended tubular boilers of steel, and twelve coxcomb furnaces, the whole constructed for a working pressure of 170 to the square inch, fitted with Howden's system of forced draught. The boilers measure 16½ ft. in diameter, and are 11 ft. 10 in. in length, with a heating surface of 10,000 square ft., and area fire grate of 225 square ft. The vessel is also fitted with water ballast fore and aft, and patent hydraulic cargo and steering gear by Brown Brothers, Edinburgh. The *Mokoia* is handsomely equipped. Brightness is the prevailing note in the scheme of decoration. The saloons are fitted throughout with hard wood, light painted, with chaste designs. The ladies' rooms are charmingly furnished, and the panels are hand painted. The dining saloon, a spacious hall, is done up in sumptuous style, and has accommodation for 120 persons. The vessel can carry 356 passengers—232 first-class and 124 second-class. There is a complete installation of the electric light, and the vessel is fitted with Turner's patent masthead and sidelight indicator, which will be fitted on all the vessels to be built in Messrs. Denny's yard. The vessel carries a launch, worked by an oil motor instead of by steam. The pleasure of the trip was somewhat marred by the wretched weather, rain falling heavily all day, accompanied by a strong wind. There was a large company of ladies and gentlemen on board. After running several times the measured mile the vessel cruised down the Firth.

Storfond.—On October 25th the new steamer *Storfond*, built by Messrs. Russell & Co., Port Glasgow, for Consul Sigval Bergesen, of Stavanger, went down the Clyde on her trial trip. The trial was in every way satisfactory, the mean speed obtained being over 11¼ knots. The vessel is designed to carry a deadweight of about 5,800 tons on a light draught, and is fitted with the most modern appliances for such a vessel. She has triple-expansion engines by Messrs. Rankin & Blackmore. The hull has been superintended by Captain Eskeland, representing the owners, and Mr. T. H. Page, consulting engineer, London, has superintended the construction of the engines.

Wakool.—On Wednesday, October 26th, the s.s. *Wakool*, built by the Sunderland Shipbuilding Co., Limited, to the order of W. Lund, Esq., of London, (full particulars of which we gave in our launch columns, September issue, page 247), was taken to sea on her trial trip, this being the fifth vessel constructed by the above firm for this gentleman. During the trial the whole of the machinery worked with the greatest satisfaction.

Hongkong Maru.—On October 27th this vessel was taken for trial. She has been built to the order of Messrs. M. Samuel & Co., of London, on behalf of the Toyo Kiren Kabushiki Kaisha, of Tokio (The Oriental Steamship Co., of Japan) by Sir James Laing, Sunderland, and is constructed from the plans and specifications of Messrs. Flannery, Baggallay & Johnson, of London and Liverpool, (full particulars of which we gave in our launch columns, August issue, page 207). The machinery performed very well upon trial, everything working at all pressures in the most satisfactory manner. An exhaustive trial was made of 10 full speed runs upon the measured mile in addition to reduced speed trials. A mean speed of 16¼ knots was obtained, and after a satisfactory day's work, the ship returned to port for completing examination before proceeding to London to load outwards. Her sister ship has just arrived in Japan after a satisfactory voyage out.

Manchester City.—On Thursday, October 27th, the fine steel screw steamer *Manchester City*, built by Sir Raylton Dixon &

Co., Limited, Cleveland Dockyards, Middlesbrough, for the Manchester Liners, Limited, (of which we gave full particulars in our launch columns, July issue, page 163), was taken out to sea for her official trials under the command of Captain Forrest, which were most successful and gave much satisfaction to her owners and builders.

Prince George.—On October 28th the *Prince George* was taken out for a 300 miles run on the North Sea and the trial, which was made between the Newsand Light Ship and Scarborough Castle, gave a mean speed of 20·338 knots per hour, the engines running steadily throughout, the mean revolutions being 172. Mr. W. R. Campbell, the chairman of the railway company, Mr. Baggallay representing the consulting engineers, and Mr. Pearson and other representatives from the various departments of the builders' yard were present. The *Prince George* has been built by Earle's Shipbuilding & Engineering Co., Limited, Hull, to the order of the Dominion Atlantic Railway Co., and is of the following dimensions, viz.:—Length, 290 ft.; breadth, 38 ft.; depth, moulded to main deck, 17 ft. 6 in., with a complete awning deck above this; there are also on it large deck houses of steel extending nearly the whole length of the vessel, the roofs of these being carried to the ship's side so as to form a shelter for passengers as well as a platform for the boats. The forward part is protected from the wash of the sea by a turtle back of steel. The ship is built of steel to Lloyd's requirements and under special survey, with considerable additions to the scantlings required by the rules. As the ship is intended primarly for the express traffic almost the whole available space has been appropriated to passenger accommodation. Amidships, under the awning deck, is the dining saloon, a spacious apartment designed for 100 passengers. The walls are panelled in polished light and dark oak of a very handsome design, and the upholstery to match, and very sumptuous. Forward of the saloon is a ladies' boudoir, and toilet room, very commodious and handsome apartments. The remainder of the main deck is occupied by state rooms, bath rooms, lavatories, pantries, and all necessary conveniences, store room and officers' and crew's quarters, all of which are very elaborately arranged in a handsome and luxurious style, and similar accommodation is provided under the main deck forward and aft. The total number of first-class sleeping berths is 340. Comfortable accommodation is also provided in the forward 'tween decks for 44 second-class passengers. The vessel is propelled by two independent sets of triple and compound surface-condensing engines, each with four cranks and driving a separate screw, and adapted for working at a high speed, the two giving out ample power to enable the ship to attain a speed of 19 knots per hour. The boilers are four in number, of the single-ended cylindrical return tube type, working at a pressure of 180 lbs. per square inch, and each pair has a separate funnel. The boilers are arranged to work under forced draught on the closed stokehold principle, air being supplied to them by two electrically-driven fans. The ship has a full outfit of boats and all life saving and fire extinguishing appliances as required by both the British and American law. The vessel being designed throughout to fulfil all the requirements of a first-class passenger express service between Boston, Massachusetts, and the Canadian maritime provinces, and will no doubt be very popular and a great favourite with travellers in the Western Hemisphere.

Ultonia.—On October 28th the s.s. *Ultonia*, which has been built for the Cunard Steamship Co., Limited, by C. S. Swan & Hunter, Limited, (of which we gave full particulars in our launch columns, July issue, page 163), was taken out to sea for her trial trip, when the engines worked with perfect smoothness, but owing to the mistiness of the weather, the measured mile post could not be seen, and the speed taken, but Captain Watson and Mr. Rain, the company's marine and engineer superintendents expressed themselves highly satisfied with the manner in which the vessel behaved. On the departure of the visitors, the vessel proceeded on her voyage to Boston to load her first cargo.

Severn.—On Saturday, October 29th, the fine steel screw steamer *Severn*, built by Sir Raylton Dixon & Co., Limited, Cleveland Dockyards, Middlesbrough, for the Royal Mail Steam Packet Company, London, (of which we gave full particulars in our launch columns, August issue, page 207), was taken out to sea for her official trials by Captain Pearce. On the conclusion of the trials which were very satisfactory, after attaining an average speed of over 13½ knots on the measured mile off Whitley, she proceeded to Southampton.

Earlswood.—On October 29th the *Earlswood* left the hands of her builders, Messrs. R. Craggs & Sons, Tees Dockyard, Middlesbrough, and after adjusting compasses in the Bay an hour's run was taken to test the machinery. The vessel was engined by Sir C. Furness, Westgarth & Co., Limited, of the same port, and during the run the engines developed over 1,200 H.P. and ran with the utmost smoothness. The owners, Messrs. Constantine, Pickering & Co., were represented by Mr. J. and Mr. William Constantine, who expressed entire satisfaction with both the vessel and machinery. The vessel subsequently sailed direct for Baltimore in ballast, in command of Captain D. M'Gregor. The *Earlswood* is of the improved single-deck type, and carries 4,120 tons on a draught of about 18 ft. and a net tonnage of 1,480. The hull and engines have been surveyed during building by Mr. Arthur Walker, of West Hartlepool, and Mr. William Constantine, of Middlesbrough.

Royalist.—On October 29th a numerous company of prominent members of the fishing trade of Hull accepted the invitation of Mr. George Walton and accompanied him upon the trial trip of the steam trawler *Royalist*, which has been constructed to his order by Messrs. Cook, Welton & Gemmel, of Hull. The dimensions of the vessel are:—Length, 112 ft.; beam, 21 ft. 6 in.; depth of hold, 11 ft. 6 in. The engines, which are of the triple-expansion type, are of 60 H.P., and have been built by Messrs. C. D. Holmes & Co. A run was made to Spurn and thence to Withernsea, the vessel proving a thorough sea boat, and giving entire satisfaction to all on board. The *Royalist* is intended for the Iceland trade.

Muriel.—On November 1st the s.s. *Muriel*, built by the Grangemouth Dockyard Co. to the order of Sir Christopher Furness for Messrs. Orders & Handford, of Newport, Mon., went down the Firth of Forth on her trial trip (of which we gave full particulars in our launch columns, October issue, page 291). The triple-expansion engines, having cylinders 20¾ in., 33 in., and 53 in. by 36 in. stroke, with two boilers 13 ft. diameter and 10 ft. long, working at 160 lbs. pressure, with patent furnaces, four large steam winches, and Blake's patent donkey boiler have been supplied by Messrs. Hutson & Son, of Kelvinhaugh, Glasgow, and these worked with perfect smoothness and without a hitch at the trial. The owners were represented by Mr. W. J. Orders, who took the opportunity to express his entire satisfaction with the vessel, and the hope that her engines might work as those supplied to friends of his by the same engine builders, and on which not a penny had been spent during all the time they had been running. The vessel and her machinery have been superintended by Mr. A. Walker on behalf of Sir Christopher Furness, and by Mr. Boddy, marine superintendent of Newport, Mon., on behalf of Messrs. Orders & Handford.

Induna.—On November 2nd the s.s. *Induna*, built by Messrs. Alex. Stephen & Sons, Linthouse, for Messrs. Maclay & McIntyre, Glasgow, (of which we gave full particulars in our November launch columns, page 332,) ran her trial trip in spite of the storm then raging. Everything worked well, and gave entire satisfaction; and as soon as the compasses could be adjusted, she proceeded on her maiden voyage to Galveston.

Kilmaho.—On November 3rd the steamer *Kilmaho* left the Wear for a loaded trial trip. The *Kilmaho* is a cargo boat, which has been built to the order of the Seville and United Kingdom Carrying Co., Limited, Cardiff (full particulars of which we gave in our launch columns, September issue, page 246). During the trial the engines worked with smoothness, a mean speed of 10¼ knots being attained, which was considered satisfactory, the vessel being fully laden. After the trial she proceeded on her maiden voyage to Seville, under the command of Captain W. G. Renouf.

Yawata Maru.—On November 3rd and 4th the s.s. *Yawata Maru*, built by Messrs. R. Napier & Sons, Limited, Govan, for the Nippon Yusen Kaisha (Japan Mail Steamship Co.), (of which we gave full particulars in our launch columns, July issue, page 166), completed a series of speed and consumption trials on the Firth of Clyde, and although the weather was very severe all the conditions of the contract were fully implemented. The machinery consists of a set of triple-expansion engines, having cylinders 29 in., 48 in., and 79 in. diameter by 54 in. stroke, with two double and one single-ended boilers for a working pressure of 185 lbs., and fitted with the most modern appliances for efficiency and economy. The company were represented at the trials by Mr. George Macfarlane and Captain Perim. The results were very satisfactory, the contract speed being more than maintained, while the consumption of coal was considerably less than that guaranteed. The Nippon Yusen Kaisha is one of the most progressive steamship companies, and has largely assisted in the wonderful expansion of the Japanese mercantile marine; their enormous fleet is second to none in efficiency and equipment, and the three steamers built by R. Napier & Sons, are splendid specimens of merchant steamships.

Prudhoe Castle.—On November 3rd the screw trawler *Prudhoe Castle*, built by the Union Co-operative Shipbuilding Society, Limited, Blyth, for Mr. R Irvin, jun., went for her trial trip, everything working in good order, and the vessel proceeded to the fishing ground on the following day.

Principe.—On Saturday, November 5th, the small passenger steamer *Principe*, built by Sir Raylton Dixon & Co. Limited, Cleveland Dockyards, Middlesbrough, to the order of the Empreza Nacional de Navegacao a Vapor of Lisbon (of which we gave full particulars in our launch columns, November issue, page 328), was taken out to sea for her official trials. The vessel has been constructed under the personal supervision of Mr. T. C. Laws, of Liverpool.

Primo.—On Wednesday, November 9th, the s.s. *Primo*, built by Messrs. Craig, Taylor & Co., Stockton-on-Tees, for Messrs. R. S. Gardiner & J. Reay, Newcastle, proceeded to sea for her trial trip, which proved highly satisfactory. The outline particulars of the vessel are as follows:—Dimensions, 254 ft. by 37 ft. by 18 ft. moulded; raised quarter-deck type, with bridge and topgallant forecastle. She is constructed to carry about 2,200 tons on a light draught of water, and is equipped with all the latest improvements. Her engines are by Messrs. McColl & Pollock, of the Wreath Quay Engine Works, Sunderland, the cylinders being 18½ in., 30 in., 49 in., by 33 in. stroke, with two large boilers working at 160 lbs. pressure. During the whole of the trial the engines worked without the slightest hitch, and, although they were not fully opened out, owing to the fog which prevailed, a speed of close upon 11 knots was maintained on the run from the Tees to the Tyne. The owners of the vessel were represented by Captain George Harland, who expressed himself as being highly pleased with both the ship and engines.

Crewe Hall.—On November 10th the s.s. *Crewe Hall*, built by Palmer's Shipbuilding & Iron Co., Limited, to the order of Messrs. R. Alexander & Co., of Liverpool, was taken out to sea for her official steam trials. Her dimensions are as follows:—Length, 380 ft.; breadth, 47 ft.; depth, moulded, 30 ft. 10½ in. The vessel is constructed of steel to obtain Lloyd's highest class, and is rigged as a two-masted fore-and-aft schooner. She is of the three-deck type with a poop, bridge, and forecastle topgallant. The poop is fitted for the crew; the bridge covers the machinery openings amidships and is left clear for cargo or bunkers. The accommodation for captain and officers is provided for in steel deck houses on top of bridge deck, the forecastle being fitted with side houses for petty officers, and open front. Arrangements are made for carrying water ballast in a partial double bottom aft, deep tank amidships, and in the peaks. The vessel is fitted with two steel decks extending all fore and aft, and is divided into 7 watertight compartments by means of 6 steel bulkheads. She is also fitted with a complete system of shifting boards, grain hatches, and all the latest improvements for carrying grain cargoes in bulk. A powerful steam windlass is fitted for working the cables and steam steering gear amidships. She is fitted with a very complete outfit of steam winches, derricks, etc., for the rapid loading and discharging of cargoes and all the most modern improvements for a vessel of her class. She is designed to load 6,750 tons deadweight on about 25 ft. draught. The engines, which have also been constructed by the Palmer Co., are of the triple-expansion surface-condensing type, with cylinders 24½ in., 41½ in., and 70 in. by 45 in. stroke, steam being supplied by two boilers 14 ft. 9 in. long, with a working pressure of 200 lbs. During the trial, the engines worked in a highly satisfactory manner at 77 revolutions per minute, and a mean speed of 13 knots was attained on the measured mile. The *Crewe Hall* has been superintended during construction by Mr. Alexander Dalrymple, superintending engineer for the owners, and by Mr. Maxwell Hill, naval architect, of Newcastle.

Ranger.—On November 10th the screw trawler *Ranger*, built by the Union Co-operative Shipbuilding Society, Limited, for Mr. William Purdy, junr., went for her trial trip, the engines worked satisfactorily, a good rate of speed being attained, the vessel afterwards took her fishing gear on board and proceeded to the fishing ground on the same day.

Everest.—On Saturday, November 12th, the fine steel screw steamer *Everest* left the port of the Hartlepools for her trial trip. The *Everest* has been built by Messrs. Wm. Gray & Co., Limited, to the order of Messrs. Murrell & Yeoman, of West Hartlepool (of which we gave full particulars in our launch columns, October issue, page 290). Amongst the company present were:—Captain Murrell, Mr. Yeoman, and three Misses Yeoman, Mr. Younghusband (the owners' superintendent), Mr. Williams (the engine builders' representative), and Mr. Hodgson, the West Hartlepool borough accountant. The vessel was under the command of Captain Douglas, and left the port about one o'clock, in ballast trim. After adjustment of compasses by Mr. Berry, she was headed for the Tyne, and the engines fully opened out, an average speed of 10¾ knots being made on the run round to Jarrow coal spouts. The trial was eminently satisfactory, the behaviour of the ship and the performance of the machinery leaving nothing to be desired. The *Everest* loads at Jarrow and proceeds thence to Genoa.

Quernmore.—On November 12th, previous to her departure for Liverpool, this large screw steamer proceeded down Belfast Lough where the compasses were adjusted, and then having taken on board a party of gentlemen, at the invitation of the builders and owners, she cruised about the Lough, and the speed trials were entered upon which proved most satisfactory. The *Quernmore* has been built and engined by the firm of Messrs. Workman, Clark & Co., Limited, Belfast, and has been specially designed to suit the requirements of the owners, Mesers. William Johnston & Co., Limited, Liverpool, in their large cattle and cargo trade with the principal American ports. She is the second vessel that this firm has built under the classification of the British Corporation of Shipping, Glasgow, for Messrs. Johnston, and takes their B.S. class, in addition to complying with the Board of Trade requirements for a passenger certificate and the American regulations. The leading dimensions of the vessel are:—Length, 480 ft.; breadth, 52 ft. 3 in.; depth, 38 ft. moulded; with a gross tonnage of over 7,300. There are three steel decks extending fore and aft as well as a tier of beams, and above the upper deck extends the shelter deck under which the cattle are carried as well as on the bridge deck above; the number that can be accommodated being about 800. In order to deal expeditiously with the hatches, nine in number have been arranged, each with powerful steam winch. A large quantity of frozen meat is also carried and a portion of the vessel has been insulated for this purpose, and a refrigerating plant of the most approved type fitted by the Kilbourn Refrigerating Co. The electric lighting which has been introduced throughout the vessel, including cattle and cargo spaces, consists of two complete plants, and have been supplied by Messrs. W. H. Allen & Co. The living accommodation is almost all placed on the bridge deck with the exception of the cattlemen and crew who are berthed forward. The engines are a powerful set of triple-expansion type capable of developing 4,500 I.H.P., and have cylinders of 29½ in., 50 in., 82 in. diameter, with a stroke of 60 in. Steam is supplied at a working pressure of 200 lbs. from four large steel boilers. Like the hull, the machinery has also been classed under the British Corporation and surveyed by them as the building of the vessel and machinery proceeded.

Barenfels.—On Saturday, November 12th, the splendid cargo steamer *Barenfels* ran a very successful trial trip in the Flensburg Hafen. The *Barenfels* has been built by the Flensburg Shipbuilding Co., to the order of the Deutsche Dampfschifffahrts "Hansa" Co., Bremen, and is intended for their Calcutta trade. Her principal dimensions are:—Length, between perpendiculars, 418 ft.; breadth, moulded, 53 ft. 9 in., and depth, moulded, 31 ft. Classed 100 A1 at Lloyd's, and carries 8,631 tons deadweight, at 23 ft. 8 in. mean draught. She has been fitted with eight extra large winches, and two steam cranes, which are worked by a large multitubular boiler, and has an extra number of derricks, together with every facility for the rapid discharging of her cargoes. The engines have been built by the Flensburg Shipbilding Co.'s Engineering Department, and are of the quadruple type, the cylinders being of the following dimensions:—24 in., 34 in., 51 in., and 74 in. by 54 in stroke. The three large boilers are supplied with Howden's forced draught. The engines worked very smoothly throughout the trial and gave great satisfaction, the speed averaging 13 knots. The *Barenfels* has been built under the personal supervision of the Hansa Co.'s inspector, Mr. Wulff.

Atlantico.—On November 14th the s.s. *Atlantico*, built by Messrs. Russell & Co., Port-Glasgow, went down the Firth on her trial trip, and had a very satisfactory run; immediately after which she left for New Orleans. She is a steel spar-decked screw steamer, designed to carry about 5,450 tons deadweight, with engines by Messrs. John G. Kincaid & Co., Greenock. She is owned by Messrs. Eredi C. Cav. Gerolimich & Co., of Lussinpiccolo, Austria, and during construction was superintended by M. M. Camalich & Gerolimich.

Orono.—On Tuesday, November 15th, the fine steel screw steamer *Orono*, built by Sir Raylton Dixon & Co., Limited, Cleveland Dockyards, Middlesbrough, for the Plate Steamship Co., of London, to the order of Messrs. Gellatly, Hankey & Co., London (of which we gave full particulars in our launch columns, October issue, page 288), was taken out to sea for her official trials under the command of Captain Osborne. The vessel has been built under the supervision of Captain Johns, marine superintendent to the line.

Ierne.—On November 17th the steamer *Ierne*, built and engined by Messrs. Blackwood & Gordon, Port-Glasgow, for the Commissioner of Irish Lights, Dublin, of which we gave full particulars in our launch columns, November issue, page 333), went down the Firth on her official trial trip, which proved very satisfactory, the vessel having attained, after a lengthened run, a speed of fully 11½ knots. The Commissioners were represented at the trial by Mr. Douglass, their chief engineer, assisted by Messrs. Idle, Rochford, and Fleming, officers of the Irish Lights Board, who have also inspected the vessel during construction.

Mayflower.—On Thursday, November 17th, the spar deck steel screw steamer *Mayflower*, built by Messrs. Craig, Taylor & Co., Stockton-on-Tees (of which we gave full particulars in our launch columns, September issue, page 246), proceeded to sea on her trial trip in the Tees Bay, during which the engines worked in splendid order, and a speed of over 11½ knots was maintained, which was considered highly satisfactory. After the trial the steamer at once proceeded on her voyage to New Orleans, under the command of Captain G. W. Denton.

Medjerda.—On Friday and Saturday, November 18th, and 19th, the mail steamer *Medjerda*, which has been built for the Compagnie de Navigation Mixte of Marseilles, by Messrs. Wigham Richardson & Co., at their Neptune Works, Newcastle-on-Tyne, went for a highly-successful series of trial trips off the coast. She is destined to maintain the mail service between Marseilles, Tunis, and Algiers. The vessel is built of steel to take the highest classification under the Bureau Veritas, and has been granted the mark of insubmersibility. She is 287½ ft. in length by 36 ft. 2 in. beam, by 25 ft. 10 in. depth, and is rigged as a schooner. She has very luxuriously fitted accommodation for forty-two first-class passengers amidships, comprising saloons, smoking room in deckhouses, ladies room, and twelve state-rooms. There is also accommodation for forty second-class passengers aft, forty third-class forward, and about 200 deck passengers. The steamer is also lighted throughout by electricity, heated by steam, and has an installation of electric bells and telephones. The propelling machinery has also been constructed by Messrs. Wigham, Richardson & Co., and consists of a four crank triple-expansion engine, on the Yarrow, Schlick & Tweedy System Limited, which on the trial trips worked without the slightest hitch, giving the greatest satisfaction to all concerned, the absence of vibration, even when running at the highest speeds, being most marked. On the Friday the six hours' speed trial was carried out, and a speed of 16¼ knots was easily maintained. The consumption trials were most successfully achieved on the following day. The owners were represented by Mr. Durbec, their agent general, and Mr. Matagrin, their superintendent engineer, whilst Mr. Tweedy, Mr. J. Denham Christie, and Mr. G. B. Richardson represented the builders. After the trial trips the vessel returned to complete her cargo, and sailed on Thursday morning, November 24th, for Marseilles, under the command of Captain Clerc.

Anglo Chilian.—On Saturday, November 19th, the steamer *Anglo-Chilian* (of which we gave full particulars in our launch columns, November issue, page 329), left the shipbuilding yard of Messrs. Short Brothers for her trial trip, which proved in every way satisfactory. After adjusting compasses a series of runs was made over the measured mile, and a mean speed of 12 knots was attained. After the trial trip the vessel proceeded to Cardiff to load for the River Plate, under the command of Captain Perry.

Fashoda.—On November 19th the *Fashoda*, the latest addition to Messrs. Maclay & McIntye's large fleet of steamers, made a most successful trial trip on the Clyde within three weeks of her launch. Having a full cargo on board, and being all ready for sea, the vessel immediately after the trial proceeded on her voyage to the River Plate. The *Fashoda* is a screw steamer of 4,600 tons deadweight, built by John Reid & Co., Limited, Glasgow, and engined by Messrs. Alex. Stephen & Son, Linthouse. This is the 50th vessel owned by the above enterprising firm.

Sigrid.—On Saturday, November 19th, the screw steamer *Sigrid*, built for Messrs. Helmsing & Grimm, of Riga and Libau, by the Blyth Shipbuilding Co., Limited, of Blyth, shipbuilders and graving dock owners, was taken to sea for her trial trip previous to loading. The dimensions of the vessel are:—Length, 297 ft.; breadth, 43 ft., and depth, 21 ft. 3 in., and she has been built to Lloyd's highest class, with triple-expansion engines 22 in., 36 in. and 59 in. by 39 in. stroke, by Messrs. Blair & Co., Limited, of Stockton-on-Tees. Satisfactory trials of speed were made, the engines working smoothly throughout. After trial the vessel was taken to the Tyne to load. The vessel has been built under the superintendence of and is commanded by Captain Kontermowitz.

Salfordia.—On Saturday, November 19th, the *Salfordia* had a successful trial at sea. She has been built by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, to the order of Messrs. Sivewright, Bacon & Co., of West Hartlepool and Manchester, for the Manchester and Salford Steamship Co., Limited (of which we gave full particulars in our launch columns, November issue, page 329). During the trial the machinery worked without a hitch, there being a full supply of steam, and no heating of the bearings. A speed of 12 knots was obtained over the measured mile, which was considered highly satisfactory. The trial was attended by Captain Bacon, Captain Crisp, who takes command, Mr. J. Robinson, of Manchester, Mr. J. C. Clark, and Mr. P. Phorson.

Raphael.—On November 21st the trial trip of the s.s. *Raphael*, built for Messrs. Lamport & Holt, Liverpool, by Messrs. D. & W. Henderson & Co., Glasgow, took place. The steamer has been constructed under British Corporation rules, and is specially designed for the River Plate trade. Her dimensions are:—Length 380 ft., breadth, moulded, 50 ft., depth moulded, 30 ft. 6 in., and she carries a deadweight cargo of 6,500 tons. The vessel is specially adapted for the conveyance of live stock, having a complete shelter deck extending her entire length above the main deck, with permanent cattle fittings of the latest type, while superior accommodation for cattle attendants is provided. She has also a complete installation of electric light, and is otherwise fitted throughout with all the most modern improvements. Eight steam winches have been supplied, and the gear generally is of the most ample and efficient description for the quick and safe handling of cargo. The engines, which are triple-expansion, have also been built by Messrs. D. & W. Henderson & Co., the cylinders being 27½ in., 46 in., and 74 in. diameter, with 48 in. stroke, steam being supplied by three single-ended boilers, fitted with Howden's system of forced draught, and working at a pressure of 180 lbs. The trial was very satisfactory, the speed on the measured mile being close on 13 knots.

Needles.—On November 22nd the screw steamer *Needles*, the latest addition to the ocean-going fleet of the Clyde Shipping Co., Limited, built by the London & Glasgow Engineering & Shipbuilding Co., Limited, proceeded down the river on her trial trip, and after a full-speed trial between the lights and in the Firth, when everything worked smoothly and most satisfactorily, the vessel proceeded right away for Cardiff, to load for the East.

Change of Address.—We are informed that Leask's Marine Academy has been removed to larger and much more convenient premises, at No. 91, Minories, Tower Hill, London, E.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from October 7th to November 2nd, 1898.

21127	T. Christie. Ships' berths.
21140	J. W. Graydon. Bulkhead doors.
21143	H. E. Newton (C. C. Worthington, United States). Steam pumps.
21162	S. Quincey. Valves for steam engines.
21168	F. A. Hubbuch. Lubricator.
21177	W. Marr. Davits for hoisting ships' boats.
21222	W. Cornelis. Reversing gear for ships.
21259	L. S. Bickley. Artificial lake of sea water.
21261	T. Wardell. Internal combustion engines.
21380	S. C. Davidson. Rotary fans and pumps.
21390	R. Smart. Propelling apparatus for ships.
21402	G. W. Duvall. Boiler-tube ferrules.
21403	J. P. Smith. Water power pumping apparatus.
21414	Galloways Limited, and W. Bayliss. Multiple-flue boiler.
21426	W. W. Hall. Pistons for steam engines, &c.
21486	H. B. Graham. Internal combustion engines.
21490	C. A. McEvoy. Ships' logs.
21507	J. B. Cousins. Ships' log.
21517	J. H. Klencke. Transporting ships boats across deck.
21521	J. R. Wigham. Occulting lights for buoys.
21548	W. W. F. Pullen. Packing the glands of engines.
21549	W. S. Miller. Steam generators.
21565	E. Edwards (J. Blumenthal, Germany). Regulating steam.
21574	D. Joy. Valve gear for steam engines.
21590	J. G. Lorrain (J. F. Lewis, United States). Lubricators.
21647	F. W. Gordon. Engine valve and valve gear.
21788	J. H. Klencke. Boat-lowering apparatus.
21802	J. F. Child. Water-level indicators.
21817	O. J. Berghoff. Apparatus for steering ships.
21847	A. F. Hack. Water-tube boiler fire-box.
21859	J. Wardle, R. Hancock, and J. Maude. Metallic packing.
21874	J. T. Pearson. Boilers.
21891	W. T. Ellison. Valve gear for steam engines.
21899	J. Robertson and T. Berry. Boat chocks.
21903	T. W. F. Cherry. Cylinders and slide valves.
21957	P. R. de F. deHumy. Shafting for propellers.
21965	J. Gobey and J. Bloomfield. Trawl gear.
21967	A. M. Clark (C. A. Hutchins, Canada). Moorings for buoys.
22006	R. Richardson. Controlling steering gear.
22048	E. Read. Replacing rivets in ships' hulls.
22053	P. Fyfe and A. Phillips. Ships' side lights.
22173	H. Siebert. Water-tube steam generators.
22100	J. H. Smiles. Piston-rod glands for engines.
22134	H. M. Bowie. Tightening the battens of ships' hatches.
22161	C. E. Henriod. Internal combustion engines.
22189	H. and S. H. Hawkins. Propelling ships.
22194	G. A. Dibbeli. Rotary steam engines.
22210	R. Richardson. Steering and warping gear.
22224	W. Bagshaw. Piston rings.
22225	J. Thom. Operating marine feed pumps.
22226	J. Thom. Air pumps for condensers.
22229	A. Dobson. Steam engine pistons.
22331	W. Schmidt. Superheater for tubular boiler.
22349	H. H. Leigh (W. H. Rothwell). Ships' davits.
22358	N. F. and W. T. Anderson. Steam boilers.
22359	H. J. B. Gravier. Ship protectors.
22362	A. F. Pendleton. Lifeboats.
22378	R. Barr and T. Edington. Life-saving boats.
22414	J. T. O'Callaghan. Submarine explosive mine.
22433	J. A. Lewis and A. Fredrickson. Journal bearings.
22453	A. Comte des Fours. Lowering ships' boats.
22457	R. P. Voigt. Valveless pumps with rotating pistons.
22463	W. Peck. Internal combustion engines.
22487	J. W. Nasmith. Steam traps.
22496	W. B. Culver. Preventing screw-propeller racing.
22508	G. Rydill. Signals for sailing vessels, &c.
22550	E. H. Hamilton. Ships' davits.
22551	H. Courteen. Steam generators.
22565	T. F. Gillespie. Tackle for ships' derrick.
22669	J. H. Smiles. Condensers for marine engines.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

Extra First Class.

October 22nd, 1898.	Cooper, Wm.	Ex. 1C	North Shields.
" "	Dennis, Jos. T.	Ex. 1C	Liverpool.
" "	Frame, Alex. T.	Ex. 1C	Glasgow.
" "	Paterson, Jas.	Ex. 1C	Leith.
" "	Rutherford, R.T.	Ex. 1C	North Shields.
" "	Stevens, Robert.	Ex. 1C	" "

October 22nd, 1898.

Allan, Henry K.	2C	Glasgow
Betterton, E.G.	2C	S'hampt'n
Bineham, Alf...	2C	London
Bowman, A. E.	2C	N.Shields
Brayshay, A.W.	2C	W.H'pool
Brown, R. C...	2C	London
Carr, L. S.	2C	N.Shields
Corran, Arthur	2C	Liverpool
Cushing, J. H.	2C	"
Danby, H. C. ..	2C	W.H'pool
Dasey, G. W. ..	2C	"
Davidson, R. H.	2C	London
Foster, Jas. G.	2C	N.Shields
Geddes, Jos. ..	1C	Glasgow
Guy, R. G. W.	2C	W. H'pool
Hall, Jas.......	1C	N.Shields
Harris, J. W. ..	1C	W. H'pool
Harvey, F. S. ..	1C	London
Ingledew, C. H.	2C	N.Shields
Jones, Harold E.	1C	Liverpool
Lee, Ernest	2C	N.Shields
Lothian, Robert	2C	Dundee
Low, Wm.	1C	"
Marshall, R. J.	1C	N.Shields
M'Clintock, E.E.	2C	W.H'pool
Metcalf, Geo. E.	1C	Liverpool
M'Intosh, D. ..	1C	Glasgow
M'Leish, Wm.	2C	Cardiff
M'Millan, Thos.	2C	Glasgow
M'Naughton, A.	2C	Dundee
M'Pherson, J...	1C	Glasgow
Nicholson, D...	1C	W.H'pool
Oliver, John ..	2C	"
Pavitt, E. J. G.	2C	London
Poundor, James	1C	W.H'pool
Power, Wm. M.	2C	London
Ryding, Wm. ..	2C	Liverpool
Travers, R. H.F.	2C	S'ampt'n
Walker, Robert	2C	Glasgow
Walker, Wm. ..	1C	N.Shields
Wallace, John..	2C	Glasgow
Walton, J. W.	2C	W. H'pool
Weber, Alexr. ..	1C	Glasgow
Whelpdale, T...	2C	W.H'pool
Whyte, David..	1C	Dundee
Wilkie, Jas. B.	1C	Liverpool
Wilson, Wm. J.	2C	W.H'pool
Wood, Alf. E. ..	2C	"

October 29th, 1898.

Armstrong, C.H.	2C	London
Bacon, H. G. ..	1C	Hull
Bayly, Robt. H.	1C	Aberdeen
Bent, William..	2C	S'nd'rl'nd
Cairns, Robert	2C	N.Shields
Cowan, David..	2C	Londondy
Ferguson, Geo.	1C	Aberdeen
Fleming, F. A.	2C	London
Hall, Donald B.	2C	Liverpool
Jones, James ..	1C	N.Shields
Kirkwood, T. ..	1C	Aberdeen
Leys, James ..	2C	"
Phinn, Alexr...	1C	Liverpool
Rae, Robert ..	2C	Aberdeen
Robertson, J. W.	2C	"
Robertson, J. ..	1C	London
Sharpe, H. H...	2C	Liverpool
Smith, John S.	1C	Aberdeen
Stalker, Peter..	2C	London
Stobbs, Wm. Y.	1C	N.Shields
Tully, Chas. J.	1C	Sunderl'd
Vickers, J. H.	2C	Hull
White, G. D. S.	2C	London
White, James..	1C	Aberdeen
Wilkinson, R.H.	2C	Liverpool
Williams, J. H.	2C	"
Wood, Chas. G.	1C	"

November 5th, 1898.

Andrew, David	2C	N.Shields
Corbett, A. J...	1C	Glasgow
Cross, S. D.....	2C	London
Cunningham, J.	2C	Glasgow
Dawson, Geo. E.	2C	Liverpool
Fletcher, Wm...	2C	Glasgow
Fullarton, Lewis	2C	"
Gerrie, Robt. G.	2C	N.Shields
Glen, Robert ..	1C	London
Graham, David	1C	Glasgow
Harper, Louis..	1C	"
Harris, Thos. C.	2C	"
Horsburgh, L.G.	1C	London
Howell, S. F. ..	1C	Cardiff
Johnes, A. P. ..	2C	Liverpool
Kelt, James ..	2C	Glasgow
Kemp, E.	2C	"
Kerr, Alexr. ..	1C	"
Lang, Robert ..	2C	Liverpool
Law, John	2C	Glasgow
Lawson, David	1C	"
Mansfield, H.W.	1C	London
M'Lure, Malcolm	1C	Glasgow
M'Millan, J. A.	1C	"
Moffitt, Hudson	2C	N.Shields
Mould, Geo. M.	2C	Liverpool
M'Robie, Frank	1C	N.Shields
Murray, John ..	1C	Glasgow
Neil, Robert ..	1C	"
Rennie, G. M...	1C	S'hmpt'n
Ryan, John J.	2C	Glasgow
Sutherland, H.	2C	"
Work, Thos. F.	2C	Cardiff
Wright, Wm. ..	2C	London
Young, James..	1C	"

November 12th, 1898.

Balchin, W. G.	1C	London
Beaton, Alex. ..	2C	Leith
Binnie, John S.	1C	London
Blyth, Thomas	1C	Greenock
Bradley, Geo...	1C	N.Shields
Chapman, John	2C	"
Fleming, J.D.S.	1C	Greenock
Fowler, J. Hy.	1C	Hull
Gordon, James	2C	Leith
Gray, Alex. ..	2C	Greenock
Griffiths, Ed. ..	2C	Liverpool
Haig, Geo. E. ..	2C	Leith
Houston, Gr'hm	2C	Greenock
Hutton, Hugh..	1C	"
Law, Wm. T...	2C	"
Le Masurier, J.	2C	London
MacKay, Geo.H.	1C	Greenock
Mackay, H. ..	2C	Leith
Maude, Alf. ..	2C	N.Shields
Maughan, T. W.	2C	"
McIndoe, Wm.	1C	Greenock.
McKenzie, D. ..	2C	"
Ross, Robert K.	2C	Leith

The Marine Engineer.

LONDON, JANUARY 1, 1899.

THE superior advantages of Milford as a port for taking passengers and mails by fast steamships between Great Britain and North America has frequently been pointed out in detail by the MARINE ENGINEER and other newspapers. Numerous efforts have also been made to run such ships between this Welsh port and New York, and between the former and some Canadian port; but all these attempts have failed to be realized. Such failures appear to have resulted in a great measure from the fact that in recent years great progress has been made in improving the voyages, both in rapidity, comfort, and otherwise of the transatlantic liners from Liverpool and Southampton. In consequence of such improvements but very little has been published during the last three years in favour of a fast steamship passenger service between Milford and any part of North America. The public interest, however, in this subject has been very conspicuously revived during the last three weeks by the publication of the intention of the recently established Canadian Steamship Co. to run a fast line of passenger and cargo steamers between Milford and Paspebiac in Canada. The latter port is in the Bay of Chaleur, and ninety miles south of the mouth of the Gulf of St. Lawrence. This route will be available for the passage of steamers all the year, as it is free from ice. The originators of the line have no connection with the different schemes which have been advocated and attempted to secure a subsidised fast service between Great Britain and Canada. Their only object is to secure an outlet for goods to the ocean from the Atlantic and Lake Superior Railway of Canada, and particularly from New Brunswick, by its chief port, Paspebiac. At present two steamers have been taken up for the new route, which are the *Gaspesia* and the *Paspebiac*. The former sailed on the 8th ult. with 50 passengers and a good cargo. A large company had been invited by the Canadian Steamship Co. to lunch on board, and to inspect this first ship of the intended important fleet of the company. Those who accepted the invitation left London by a special train which was run through to Milford, a distance of 285 miles, in a little over 5½ hours. Mr. Newbon, the chairman of the Milford Dock Co., properly stated in his reply to the toast of prosperity to that company, that their triumph of commencing a transatlantic service might have come sooner if there had been a little less opposition to such. He added that "some of them had been waiting many years for that great event, and now that a beginning had been made they were looking forward hopefully to great developments. Canada imported large quantities of anthracite coal from the United States, but that fuel could be sent in unlimited quantity from Milford, whilst on the return voyages, in addition to dairy produce and corn, they might hope for the establishment of a good trade in cattle, &c." It is proposed to have four fast steamers on the route, and to run a weekly service. It is claimed that by the new line passengers can be landed in Canada in six days from Milford, which is a much shorter time than that in which they are generally landed at present by other lines from Great Britain. The new scheme has the support and sanction of the Great Western Railway Co., who will run special express trains to and from Milford in connection with the departure and arrival of the Canadian Steamship Co.'s ships. These trains will be provided with refreshment cars. This company is well managed, and no profit is to be obtained from it except for the conveyance of passengers and goods. We are informed that a powerful syndicate is being established in London for enlarging the docks, and the further development of trade to and from Milford. It is confidently expected that if the new route to Canada from that port on which the first steamer has been run should prove a success, that one or more transatlantic lines will be established in the near future to run between Milford and New York, or some other port in the United States. In this event an enormous shipping trade may shortly afterwards be expected there, and excellent means exist, by coastwise and other short voyage ships, and railways for the conveyance of passengers and goods to and from Milford.

THE Board of Trade returns on mercantile marine, including totals of imports and exports of the United Kingdom, contain food for some curious reflections and deductions. There are some curious omissions in the totals of exports and imports that we understand for the future will be rectified. Certain large items of export and import, which are exempt by law or custom from entry at the Customs, are not included in such returns. When we state that all tonnage for war or mercantile purposes, built by us for foreigners, are for that reason not included in the returns; that all diamonds imported by us from the Cape, and all coal shipped for use in steamers at our ports are similarly omitted, it will be seen that these omissions are of considerable magnitude, and would greatly aid to swell totals included. The gross tonnage of steamers and sailing vessels, either built new or sold second-hand to foreigners, is estimated to amount to nearly 450,000 tons. The value of Cape diamonds imported in 1897 was of value nearly four and a half millions sterling, and it is estimated that nearly 10 millions of tons of coal are annually shipped in the bunkers of steamers engaged in foreign trade. A still more pregnant result from the analysis of total exports and imports, and of the mercantile tonnage afloat, is that though the totals of the world's trade oversea is still on the increase, the gross tonnage of vessels afloat in comparison is decreasing relatively to the trade moved. This is a good sign for shipping interests, as it shows conclusively that our mercantile marine is steadily carrying a greater proportion of freight per tonnage of vessel in a year. This is no doubt due to the considerable average increase in effective speeds afloat, and also to the better plant and facilities for loading and unloading in docks and wharves. The returns, therefore, on floating tonnage will have been better by 5 or 10 per cent. in the last year or two than formerly, which no doubt is at the bottom of the increased confidence of shipowners, as seen in the record outputs of the last year in our large shipbuilding yards, and in the large orders at present in hand.

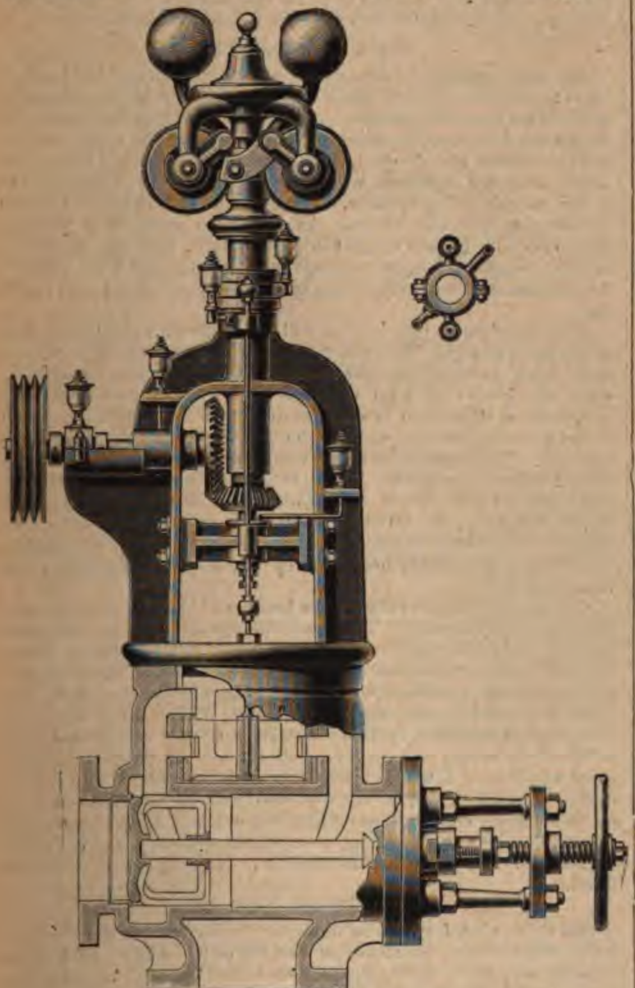
The Admiralty are still endeavouring to maintain their lately acquired credit of being in the fore-front in experimenting upon any new developments in naval engineering. They are now sifting the advantages and disadvantages of liquid fuel, as applied to torpedo-boat destroyers, to the bottom. They consider the experiments that have already been made with the *Surly* to be encouraging, and we must not be surprised if shortly an order should be given to fit up some of the new destroyers with arrangements to burn liquid fuel. The difficulty, if any, will not be in efficient appliances to carry out such modes of combustion with economy and high steaming power, but will rather lie in the ensuring of a large supply of the required fuel at its present moderate price without such price at once rising with the demand. The Russian steamers on the Volga and Eastern waters, where the supply of liquid fuel is cheap and plentiful, have long proved the practicability and the economy of such fuel. There is one possible practical difficulty that we anticipate in the employment of liquid fuel in war, and that is the necessary absence of tell-tale smoke from the funnels of torpedo boats or destroyers. A heavy hydro-carbon, such as is cheap and of great calorific value, has a tendency to burn with a heavy black smoke. But this can only be due to an insufficient supply of oxygen at a sufficiently high temperature producing incomplete combustion. We have no doubt hat a forced and heated draught will entirely remove such objection, though we understand that this point has not so far been overcome in the apparatus fitted to and tested upon the *Surly*.

Engineers have long pursued the delusive will-o'-the-wisp of endeavouring to utilize the mighty natural movements or forces of the sea in its tides and waves to operate appliances subservient to the will and wants of human kind. Very little has as yet resulted from such efforts in a practicable form, but the latest development of a self-propelling mechanism attached to a boat, and operated by the rise and fall of the boat upon the waves, has most nearly arrived to the embodiment of such an idea. Mr. Linden, of Naples, has built a boat 13 ft. in length by 3 ft. in breadth, with a depth of 20 in., and within a weight of 400 lbs., to which he has adapted a double set of propelling fins fore and aft, which will actually propel a boat against the wind without any engine and without any exertion of the occupant, provided there is any wave movement at all, which there generally is on the ocean, even in a so-called smooth sea. The apparatus is simplicity itself. Two brackets, fore and aft, carry a series of fine steel strips horizontally. These are termed fins, and the after bracket is pivoted on the rudder pintles, and carries the rudder above it. Every roll and pitch of the boat move these fingers or fins, which are 20 in. long and 10 in. wide from their normal horizontal position, and the elasticity of the steel bringing them back to horizonal, give a rearward impulse on the water as the tail of a fish would do, but in a vertical rather than in a horizontal plane. There are four of these fins on each bracket, and the accumulation of these eight tiny efforts serve to propel the boat in question at from three to four miles an hour. This is a most ingenious contrivance, and is probably only as yet in its crudest form as regards the conservancy and accumulation of the agitating motion of the waves. What its ultimate development will be is hard to foretell, but it would have this advantage, that its accumulation and return of energy would increase in proportion as the winds and the waters rage. It is a neat mathematical investigation for naval experts to determine the horse power developed by the tossing of an Atlantic liner by the wave motion over ordinary storm-driven billows in the Atlantic. We believe that the horse power developed in the enforced rise and fall of such a mass by the ocean billows would at least be equal to the horse power usually used for propulsion.

Institute of Marine Engineers.—The tenth annual conversazione of this Institute will be held in the Town Hall, Stratford, on Friday, January 20th, 1899, when the President, John Inglis, Esq., LL.D., will deliver a short address.

SPECIAL GOVERNOR FOR HEAVY ENGINES.

IT is a well-known fact, in connection with steam engine practice, that in the larger sizes of the ordinary types of combined governor and valve, some of the parts are frequently subjected to considerable wear, chiefly owing to the want of efficient lubrication, and a good deal of trouble and expense is generally involved in replacing or repairing the worn parts, on account of the difficulty of handling the great weights of the governor. Messrs. Schäffer & Budenburg, of Manchester, London and Glasgow, have recently patented the governor shown in the accompanying illustration, which is designed to overcome the difficulties above referred to. In this apparatus all the chief parts subject to wear can be kept in a state of perfect lubrication, a number of lubricators with adjustable sight-feed being provided for this purpose. Wherever possible there are also provided simple adjustments for taking up all wear, and the whole of the wearing parts are made easily accessible, so that any of them can be readily replaced whenever this may be necessary, without disturbing the governor head or other heavy portions of the apparatus. A strong bridge bolted to the frame is provided for carrying the heavy rotating masses of the governor. The main revolving spindle which supports the governor-head, and upon which is fixed the horizontal bevel-wheel, is carried in a step-bearing arranged in this bridge. The wear in the step-bearing can be taken up by a simple set-screw adjustment to allow of restoring the perfect engagement of the wheels in case of any wear. The horizontal bevel-wheel is "under driven," so that it cannot press upon the vertical bevel-wheel in consequence of wear in the step-bearing. The end of the driving shaft is mounted in an adjustable bearing, on each side of which adjustable collars are fitted for the purpose of regulating the engagement of the vertical bevel-wheel at the end of the shaft. Both bevel wheels can thus be maintained in perfect gear. The throttle valve is supported from the governor sleeve by means of two rods, each guided top and bottom. These rods are connected with corresponding cross pieces, between which the lengths of the rods are adjustable, to allow of altering the position of the valve if required.. The governor sleeve itself is fitted with a bush in two halves, and the bush when worn out can be readily renewed at a very small cost. This special form of governor, it may be added, is designed exclusively for the heavy class of stationary land engines, and is only applicable to steam pipes of from seven inch diameter upwards.



THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

The "Mohegan" Inquiry

did not conclude in time for me to report its finding in the last issue of the MARINE ENGINEER. The Court was unable—naturally enough—to throw any further light on a truly inexplicable occurrence. All it could say was that there was probably an error in navigation somewhere. An error which was probably of a kind to which the most careful of men are liable at times, and one which a mere apprentice to the sea might have checked. It would be a terrible thing if so many most valuable lives were lost and so much property sacrificed without leaving the world a little wiser. All the lessons that can be gathered from this sad experience can be very briefly set out. First, it is most desirable that masters should take their officers into their confidence. It would be best if they could make them work out the positions and set the courses, meanwhile watching and checking what they do. By these means clerical errors would be likely to be eliminated and a spirit of responsibility bred in junior officers against the time when command comes to them and responsibility must be assumed. Something has been said as to the boat arrangements. But beyond a very good proof of the strength and value of steel boats, nothing really was shewn in this direction. The real point—when we come to deal with *materiel* as distinct from *personnel*—is that the *Drummond Castle* experience is emphasised. The *Drummond Castle* dated from an earlier period, the *Mohegan* was from the latest type of vessel of her class. We learn that, in regard to providing ships which shall be able to resist underwater wounds from rocks, science—as applied by the best shipbuilders and the most careful class of shipowners,—has not progressed of recent years. The new Atlantic Transport ship was as vulnerable as the Castle liner, and any merchant ship afloat would probably have shared the fate of these vessels under similar conditions. Some arrangement which might minimise the danger of wounds in the bilges need to be sought. It may be that an adaptation of the watertight flats with which men-of-war are fitted might, at least, postpone the final plunge of the vessels so injured. But it may well be difficult to design hatches which shall at once be watertight and convenient for dealing with cargo. The one satisfactory feature in the case is the heroism of all concerned with the wreck, be they navigators, engineers or passengers.

The person who was charged with libelling the owners of the *Mohegan* were allowed to get off practically scot free owing to the generosity of the firm libelled. They were satisfied with showing the groundlessness of the charge made against them, and asked that punishment might not be meted out to their attacker or he might have found himself very severely punished.

The Weather at the End of November

was exceptionally severe. The Clan Line lost a vessel—their *Clan Drummond*, fifteen years of age—in the Bay of Biscay. She seems to have shipped a sea of terrific and unusual violence. It not only burst in her main hatch but also pounded in her iron deck for a space of 18 ft., whereby she quickly filled and foundered. A large number of the crew were saved by the Lamport and Holt liner *Holbein*, which was luckily close by at the time. This accident was, it is sad to add, attended with loss of life. The occasion seems to have been chosen—with singular bad taste—as a good peg upon which to hang an attack upon the Lascar element. It was said that the officers were drowned by the undisciplined struggles of their Indian shipmates. The story, however, quickly elicited a complete contradiction. The disaster in the Bay of Biscay was quickly followed by another in the Atlantic. This was the loss of the *Londinian*, a fine new cargo ship of 5,532 tons gross, built at Glasgow but two years ago by the well-known firm of Messrs. A. Stephens & Sons. This vessel, which was formerly owned by Messrs. Wilson's & Sons, of Hull, in whose fleet she appeared as the *Idaho*, was homeward bound from Boston for London, with a general cargo, 655 head of cattle and 27 cattlemen, besides a crew of about 43 persons. She became seriously overdue, and upwards of 20 guineas was paid for reinsurances in the absence of any news of her. Then came a report from the s.s. *King Arthur*, that she had been sighted on November 29th, abandoned and on her beam ends with the starboard side of her hatches under water, and with all boats save one gone. In the absence of further news it was feared that all hands were lost. Fortunately, this surmise was proved incorrect, as the Johnson liner *Vedamore* brought 45 survivors into Boston, having, after standing by for two days at very great peril, and with the loss of several of her own boats, taken these men off. The *Londinian* was lost sight of before she could complete the rescue. Nearly a week later the *Maria Rickmers* brought yet eight more rescued persons into Baltimore. These last included the master and the third officer. They had been driven on to the bridge by the rising waters, and had given up all hope, when the German steamer saw their flares, and bore down on the sinking ship. Altogether about 18 lives seem to have been lost. Of these ten were drowned by the upsetting of a boat in an attempt to reach the *Vedamore*. The lost, unfortunately, include the chief engineer, Mr. Stafford, and the third engineer, Mr. Stater, and Mr. Murray, the chief officer.

The North German Lloyd Company

is effecting great changes in its Express fleet. A few years ago its Express vessels maintained a bi-weekly service from Bremen via Southampton to New York, and at busy times it made a third dispatch within the seven days. Now its arrangements are entirely altered. A single express boat dispatched from Bremen on Tuesday, and from Southampton the following day, carries out their Atlantic mail service. During the summer there is a kind of intermediate service with the 10,000-ton *Barbarossas*—which are really Australian liners—on Sundays. They have also built the two *Kaisers*, and rejuvenated the *Spree* for the express service; and so of all the famous Fairfield ships, the *Lahn* alone will be required for the New York mails. The Mediterranean service is efficiently provided for with the *Saale*, *Trave*, *Aller*, and *Ems*, aided by the *Kaiser Wilhelm II.*, and so there are a couple of the older ships for which no use can be found. These are the *Werra* and the *Fulda*, which came out in 1882. They are fitted with three-cylinder compound engines, and are of about 5,100 tons gross. These vessels cease to be of the fleet altogether. They were at New York at the end of November, and were taken up as transports for the conveyance of troops from Havana to Spain. This duty will be accomplished in January, and the two vessels are, subject to this engagement, sold to the Canadian Pacific Railway, for which presumably they will join the *Tartar* and the *Athenian* in service on the Pacific coast.

Plymouth v. Southampton.

The very bad impression which was caused by the Plymouthian *manifesto, which I noted last month,* was very much intensified by the reply which the local authorities made to Messrs. Donald Currie & Co.'s letter. They had no sorrow to express for their highly indecent and inaccurate reference to the *Drummond Castle*. They did, indeed, admit that they were wrong in alleging that that vessel was bound to Southampton on her last trip. They were forced to do that. But they treated it as a highly unimportant inaccuracy, which by no means affected the value of the case as an argument. When we remember that they argued from the loss of this vessel that Southampton was a dangerous port to be bound for, and that they now admit that the vessel in question was not bound there at all, it will be obvious that her disaster had nothing whatever to do with Southampton or its mythical dangers. The Plymouth people have shown themselves spiteful, ignorant and absolutely wanting in feeling. Their port has no facilities, either in docks or in railways, to compare with those of the Hampshire port, and it will be very pleasant hearing when the announcement comes that the homeward bound vessels of the lines which still call in the Sound have succeeded in making other arrangements. Plymouth will have no one but herself to blame for her misfortunes.

The White Star Line

Have added another trifle of about 12,000 tons to the total of their fleet in the *Medica* which was launched by Messrs. Harland & Wolff on the 15th December. She is one of three sisters, of which the first was launched in November, and the third—which will be named *Persic*—will, I believe, be ready about February. Their January addition will be even greater than that of the other neighbouring months. For on the 14th the new *Oceanic* will be put into the water. As has been repeatedly pointed out, this will be the longest ship ever built, and will certainly be the vessel of largest tonnage and displacement at present nearing completion, even if any of the designed ships will equal her.

The occasion of the launch will be made an exceptional one at Queen's Island. The practice at the great Belfast yard has ever been to treat launches with the least possible ceremony, even as they avoid trial trips altogether. On this occasion however, a departure from precedent will be made. A great stand is to be erected, and a charge for viewing the spectacle exacted. The money so taken will be paid over to the funds of the Belfast Hospital. This is very characteristic of the chairman of the White Star Company. He seeks quiet and hates display. Yet he never allows his own personal tastes to stand in the way of the good of any public object. The hospital in question has already benefitted by his liberality on more than one occasion.

One hears constant tales of the horrors of the live cattle trade from certain countries. That these things need not be has been proved times without number by the experience of many liners trading between Liverpool and the United States. Their voyage statements have shown a wonderful freedom from injury amongst their four-footed passengers. But the White Star steamer *Georgic* has attained in this direction a record which is likely to stand for a long time, since it seems almost impossible that some accident of a trivial kind will not occur to spoil the break of any vessel which, however well designed or handled she may be, deals with so large a number of cattle. In thirteen consecutive voyages, extending over about fourteen months, she carried no less than 11,168 animals, without losing a single head.

The Cunard Line.

One thing that I am quite unable to understand is the Cunard policy with regard to the older vessels of its fleet. As I have already mentioned here, a good beginning of a clearance has been made in the Mediterranean branch. But take the Atlantic side. Allow for the moment that the new *Ultonia* is too new to have warranted any removal, or that she will be employed in extra service, there still remain the *Bothnia* and the *Scythia* in the Boston service, the *Servia* in the New York line, that are quite superfluous. Every one rejoices in the recent boom in shipping. The value of new tonnage has increased. Second-hand and breaking-up tonnage have also been unusually valuable. All this is matter of a more or less temporary nature. There has been a demand for shipping which the yards have not been able to overtake, largely owing to the late disastrous strike or lock-out in the engineering trade. But the yards are doing all they can to overtake the deficiency. How well they are succeeding will be shown by the annual returns in another part of this journal. The lucky shipowner—the shipowner who was in a position to make a little bit extra—was the man who had some surplus tonnage by him that he did not want to carry on his regular business. Surely Cunards had their opportunity here. There were the ships that I have named, and to them might for all practical purposes have been added the *Aurania*. The shipowner, so fortified as I have said, had his opportunity in being able to take a slice of the good luck that had befallen, either by running extra voyages, or by chartering his spare tonnage, or by selling his surplus ships at the top of the market. Up to now what have Cunards done? The *Bothnia* has lain whilst months creep into years in the Wallasey Dock, and the *Scythia* only went out to take an extra voyage for the broken down *Aurania*. Yet charges are piled up on these craft, and we may be quite sure that as the art of shipbuilding improves such ancient specimens are becoming ever less valuable to their owners as freight-carrying machines, and less likely to sell at anything over breaking-up price, and that price will hardly remain as high as it has lately been quoted, viz., 35s. per ton.

I quote figures to prove my general proposition:—

In 1897 the *Aurania* made eight trips (four being extra trips).
The *Servia* „ seven „ (five being extra trips).
The *Scythia* „ six.
The *Bothnia* „ none, though she was used as an hotel ship at the Diamond Jubilee.
In 1898 the *Aurania* „ four trips (two being extra trips).
The *Servia* „ six „ (five being extra trips).
The *Scythia* „ two „ (one replacing the broken down *Aurania* on an extra trip).
The *Bothnia* none.

In 1898 the four vessels regarded made twelve trips between them and the *Aurania* will commence another. Thirteen trips might have been done by one ship in a year. The lately sold *Adriatic*, to mention a rough instance, did it many years ago.

The P. & O. Company,

by its modern practice, shows plainly enough how important in these highly competitive days it is for a line that means to pay to get rid of its rubbish. Those who direct the affairs of the P. & O. allow no sentimental love of old names to stand in the way of profit. Its oldest vessel at the moment is the *Peshawur*, built in 1871. But she is exceptional. In the fleet list I find that the names of the eighteen ships which directly follow her have all been sold—many of them merely to break up. The next oldest remaining vessel to the *Peshawur* is the *Ancona*, built some eight years later. So with one exception the whole of the P. & O. fleet is under twenty years old. The *Hydaspes*, for example, a vessel built in 1872, has just recently been sold off. The purchasers were Chinese, and they intend to break her up forthwith.

An Unfounded Charge.

A sailing barquentine is hardly one of the "Fleets of the Mail Lines." Yet I should certainly be wanting if a reference to the case of Price v. George Newnes and Company (Limited) were omitted in these notes. The defendants were the publishers of a magazine which has attained a certain publicity by the publication of some adventures which its editors and proprietors allege to be true. With a view to keep interest warm it published an article in its Christmas number entitled "The Voyage of the *Molehill*." Not only is everything published in this magazine generally alleged to be true, but there was a headnote added to the article to which I refer, in which it was stated that every allegation made in the story could be verified by documentary evidence. The story was related as the experiences of an apprentice aboard a sailing vessel called the *Molehill*. This vessel was stated to be unseaworthy in every particular. Shorthanded, overladen, badly found, rotten in hull and in rigging, there was no charge that could be brought that was not pushed down the muzzle of this blunderbuss. The vessel was called *Molehill* in the article. The vessel aimed at was the *Mowhill*. The owner was referred to by as thin a disguise as the ship. His name was Price. They called him Cost, and supplemented the charges made against him in his business capacity by pleasant little allusions to his alleged hypocritical private life. Mr. Price—like a brave man—took action against this millionaire publisher. The case came on at the recent Liverpool Assizes. The defendants were at first as bold as brass. They admitted that the plaintiff was right in assuming that he and his ship were intended to be the mark of the article. They were prepared to prove every word. The Judge ordered the case to be mentioned again in two days—as he felt disinclined to order the publication of a huge Christmas number to be withdrawn in face of such a declaration of justification by a defendant of means. But when the two days were up the tune was changed. Abject apologies and wholesale withdrawals were the order of the day. These, it is pleasant to state, were not allowed to avail. A substantial sum for damages and another for full costs were awarded. It is to be hoped that before charges against owners, pilots, masters, and crew are again accepted by those who think they command the public ear, there will be some little inquiry into the value of the evidence which can be adduced in support. In the present case Lloyd's and the Board of Trade had passed the ship, and there was other evidence to prove the charges false. But sensation-mongers must be taught to appreciate that some people value their characters almost as highly as these new journalists reckon notoriety, and that which notoriety brings in the shape of money.

The White Star Calendar

this year maintains its general form, being again a series of a dozen cards—one for each month in the year—contained in a little Russia leather case. The design of the cards is, however, somewhat changed. The size of the view given on each card is somewhat reduced (though the wonderful clearness makes size a minor detail), and the little picture appears in an allegorical setting suggesting the understanding between the two branches of the Anglo-Saxon race which the line and those who direct it have done so much to cement. These designs are most artistic. Indeed, it could hardly be expected that they should be otherwise when it is added that they are the work of the celebrated *Punch* artist, Mr. Linley Sambourne. The views include three pictures of the White Star offices, one being an interior of the "Liverpool Palace of Shipping" (a thing not previously published), one of the *Oceanic* on the stocks, and another of the same vessel as she will appear when afloat; one of the New Zealand Liner *Gothic* at Plymouth, one of the *Majestic* at Liverpool, two of the Atlantic cargo boat *Cymric* (one of them a very artistic view of her launch), and a very interesting representation of the River Mersey as it appeared in the year 1846. For comparison with the graceful and powerful *Oceanic* a picture of the old *Great Eastern*, now at length surpassed in size, is afforded. The whole completes a very beautiful and useful addition to the office table and a wonderful selection of views.

Canadian Steamship Lines

seem (with the exception of the really old-established ones) to have somewhat chequered careers and startling experiences. The great Pertersen Tate Mail Line, for example, failed somehow ever to get to work. The poor Canada Shipping Company (which was perhaps better known by its sub-title, the Beaver Line) went into liquidation some time ago, and looked like being discontinued. Then Messrs. McIver took charge of it. Some of the older boats were got rid of. The *Gallia* was bought, and the mail contract secured at a time when the Canadian Post Office really wanted assistance. They improved the fleets by securing the New Zealand liner *Tongariro*. Now there is some sort of difficulty in the working. It is said that Mr. A. L. Jones's firm has bought the Beaver Line. This seems to be a mistake—at least, in Messrs. McIver's view. They say that the line belongs to them, and that they have no intention of parting with their property. It would appear from what has transpired that they run the *Gallia* and the *Tongariro* for themselves in this line, and the "Lake" boats for the liquidator of the old Canada Shipping Company. That liquidator is, of course, at liberty to do the best he can for those interested, and he may sell or dispose of anything that belongs to the old company. It would seem that he is selling some or all of the remaining Lake boats to the energetic firm in South African House. But it is questionable whether he can sell the trade name of "The Beaver Line," which Messrs. McIver say is now theirs. An interesting question may arise on this point. In this connection it may be mentioned that when the *Lake Ontario* was about to leave the Hornby Dock at noon on Saturday, the 17th December, on her advertised trip to Halifax and Norfolk, Virginia, she was stopped at the last moment, when all the passengers were aboard, by legal process.

This was done suddenly by some persons who were alarmed at the talk of transfer, and was done, it was said, without warning. She was detained, at some considerable inconvenience to passengers and shippers, till Monday, when the claims against her were discharged

ful performances of the *Kaiser Wilhelm der Grosse*, referred to in the last instalments of Notes. I may say, however, that I do not think that jealousy of the German flyer was the reason that publicity has not previously been given to these records in the Press.

Kaiser Wilhelm der Grosse.

Westwards.

Voyage.	Left Southampton.	Distance in Miles.	Passage.	Speed in Knots.	Remarks.
1	21 Sept. 1897	3,050	5 22 30	21.39	
2	13 Oct. ,,	3,055	6 0 0	21.21	Heavy gale 17th.
3	10 Nov. ,,	3,055	6 1 3	21.07	Record for day's steaming, 567 miles.
4	16 Dec. ,,	3,050	6 20 0	18.56	Heavy gales.
5	3 Mar. 1898	3,100	5 23 37	21.59	
6	31 Mar. ,,	3,120	5 20 0	22.29	Best passage as yet.
7	28 April ,,	3,115	6 3 57	21.06	Record for days' steaming, 580 miles.
8	26 May ,,	3 130	5 21 48	22.07	
9	25 June ,,	3,123	6 2 13	21.36	
10	4 Aug. ,,	3,050	6 2 10	20.87	
11					No particulars.
12	29 Sept. ,,	3,052	6 2 38	20.81	

Kaiser Wilhelm der Grosse.

Eastwards.

Voyage.	Left New York.	Distance in Miles.	Passage.	Speed in Knots.	Remarks.
1	1 Oct. 1897	2,962	5 15 25	21.37	To Plymouth. Best day's steaming, 519 miles.
2	27 Oct. ,,	3,062	6 10 45	19.78	To Plymouth.
3	24 Nov. ,,	3,065	5 17 8	22.35	Best day, 528 miles.
4	5 Jan. 1898	3,067	5 20 29	21.82	
5	16 Mar. ,,	3,027	5 19 30	21.77	To Plymouth.
6	13 April ,,	3 035	5 23 20	21.22	To Plymouth. Best day, 535 miles.
7	11 May ,,	3,035	5 16 48	22.19	To Plymouth.
8	8 June ,,	3,190	6 19 20	19.53	
9	6 July ,,	3,146	5 19 45	22 51	Best day, 537 miles.
10	17 Aug. ,,	3,070	5 23 30	21.43	Best day, 539 miles.
11					No particulars.
12	12 Oct. ,,	3,030	6 6 27	20.47	Heavy gales.

The American Line

and its connections seem to be going ahead. At present the weekly mail service from Southampton is carried on by the *St. Paul*, *St. Louis*, and the *Paris*. The *New York* lies at the other side as reserve ship. In a few weeks she will, it is announced, be despatched on a pleasure cruise of about a month's duration to the West Indies, calling at all the places which became memorable to the world, and especially interesting to Americans, during the recent Hispano-American war, in which, under the fighting name of *Harvard*, the *New York* herself took no inconspicuous part. Then there is a good deal of building and alteration in the air. It is said that the *New York* and *Paris* are to be lengthened and re-engined at Clydebank, where they were originally constructed. It is also stated that no less than six big twin-screw steamships have been ordered from British yards for this line. The lion's share of the work will go to Clydebank, where such good work was formerly done for the Inman line. They are to have an order for four vessels of large size, but of not the highest speed. They will, I should imagine, be something of the *Barbarossa* class, *i.e.*, such as will give the highest accommodation combined with moderate rates for passengers who are not in a hurry. They will also give their owners a large cargo-carrying capacity, and will work on economical lines. They will probably be employed in the Antwerp and New York branch of the trade, though they may very likely call at Southampton. The two other vessels are to be built by Messrs. Hawthorne, Leslie, & Co., of Newcastle, and will be cargo boats of the size which important lines now affect.

The North German Lloyd Company.

As desired by a correspondent—whose letter appears in another column—I have pleasure in affording some details of the wonder-

"The Germanic,"

whose accident in the Elbe was noticed in the last Notes, met with a further mishap soon after leaving Southampton for the Cape. She got into collision with a barque, the *Savernake*, about twenty-five miles from Anvil Point, and had to put back. She was holed in her machinery compartment, and might have been in a bad way if she had not been well sub-divided. Her repairs are taking some time to complete. Meanwhile the Admiralty Court has freed her from all blame in regard to the loss of the *Corso*, and, indeed, it would appear that she was well handled both before and after the accident.

"The China"

is still to be kept before the eyes and ears of the public, much as the directors of the company would probably desire to have the incident forgotten as soon as possible. Dissatisfaction was found with the constitution and decision of the Court of Inquiry at Aden, and the case is now to be re-tried in London.

A Converted Steamer.

I have to thank a courteous correspondent for pointing out that I was wrong in saying that it was the old City of Dublin Steam Packet Company's s.s. *Ulster* that was converted to a four-masted barquentine at Derry. The old *Ulster* is broken up, he says. The vessel converted was the *Cavan*. I may add that she was owned by the same company, but was not a mail boat. Her employment was in the Dublin and Liverpool service. She was younger and smaller than the *Ulster*, but she was also, when a steamer, one of the old-fashioned paddler type.

The "Campania."

"A Constant Reader Abroad" asks, in a letter which is printed elsewhere, why the *Campania's* voyage, commenced on the 30th October, was not noticed. He is under the impression that it was the best ever done to the westward by either of the two great Cunard sisters. The answer is that he has got his information from a source which was not quite accurate. He believes that she reached New York at 10 a.m. on the Friday following. If that were correct this would have been indeed a feat. But the fact is the report should have stood at *Fire Island* 10 *p.m.* on the Friday. Fire Island is forty-two nautical miles (that is two hours steaming) east of Sandy Hook, to which passengers are reckoned. So her time would be Sandy Hook midnight, and the passage is fourteen hours worse than he thinks it. It comes out at about five days eighteen hours, which is nothing for either the *Campania* or the *Lucania*.

Messrs. Elder, Dempster, & Company

returned the amount of tonnage which they manage at 307,355 tons a few weeks ago. They are surpassed by only one British line in gross amount of shipping. That line is the British India Steam Navigation Company. But as between the two, at least, amount of tonnage is by no means a test of the importance of the line, for the British India Company does little to maintain the flow of commerce—which is its life-blood—between the heart and members of the Empire. The British India boats are chiefly engaged in trading locally in the Far East, where they doubtless do much valuable work of which we hear little. Within two days in mid-December the Elder Dempster fleets were increased by two great twin-screw steamships, the *Clarence* and the *Monteagle*, launched respectively by Messrs. Sir Raylton, Dixon & Company and the Palmer Company. They also have a good half-dozen other bottoms approaching completion. Not content with this development—which may be considered natural and automatic—they are buying up this month the Canada Shipping Company, and no doubt other important extensions will shortly be revealed. Meanwhile Mr. Alfred L. Jones—who is the moving spirit of Messrs. Elder, Dempster & Company—is not altogether absorbed in his shipping undertakings, nor even in those many collateral business affairs with which he is connected. He is doing what he can by suggestion and by monetary aid to encourage scientific men in dealing with the tropical diseases whose prevalence in West Africa has so much interfered with the development of the country. No doubt science, stimulated as it will now be, will be able to do something to minimise the hideous loss of European life on the West Coast of Africa. The possibility, nay the probability, that something important in this direction will be effected, was entirely overlooked by Mr. Leonard Courtney in his very gloomy view of the condition and prospects of the Congo.

Mr. Rudyard Kipling

contributed to a Christmas number an account of the historic disaster to the *Sarah Sands*. In it he made certain statements which appeared to reflect on the officers, engine-room staff, and crew of that ill-fated ship. The story does not much matter. But it is of intense interest to see that it has elicited a very warm answer from Captain Castle—now a nautical assessor—who commanded that vessel during her terrible experience. He is vigorous still, though the time of which he speaks is forty-one years ago. He emphatically repudiates—for the sake of truth and for the honour of his dead comrades—the suggestion that any of his officers, navigating or engineering, behaved in any but the most heroic manner. All who knew anything of the circumstances of the case were aware of this already, but for the sake of the general public it is well that full publicity should be given to his protest.

THE GENERAL ENGINE AND BOILER COMPANY, HATCHAM IRON WORKS.

THESE works are situated within three minutes' walk of the Old Kent Road Station, and they appear to have started from small beginnings and extended bit by bit by press of work. This very year the yard of the works has had to be roofed over and a gallery has been fitted round one half of the shop, leaving the central part open for light to the lower shop, so that with the yard taken in and the gallery fitted round the machine shop, the area of the shop flooring is very nearly doubled.

One enters from the office into the turning shop where there are numerous lathes somewhat closely placed together; but this is probably due to pressure of space. The lathes in this shop are not of a large kind; some of the older ones have been removed and replaced by the well-known American lathe. The workmen in this shop appear to take to it, if one should measure these things by the apparent ease and quickness with which they set about their work. There was between the centre of one of the large lathes near the door a three-throw crank for a triple air-compressing engine, the notable thing about it being the high finish which the workmen had got it to take on.

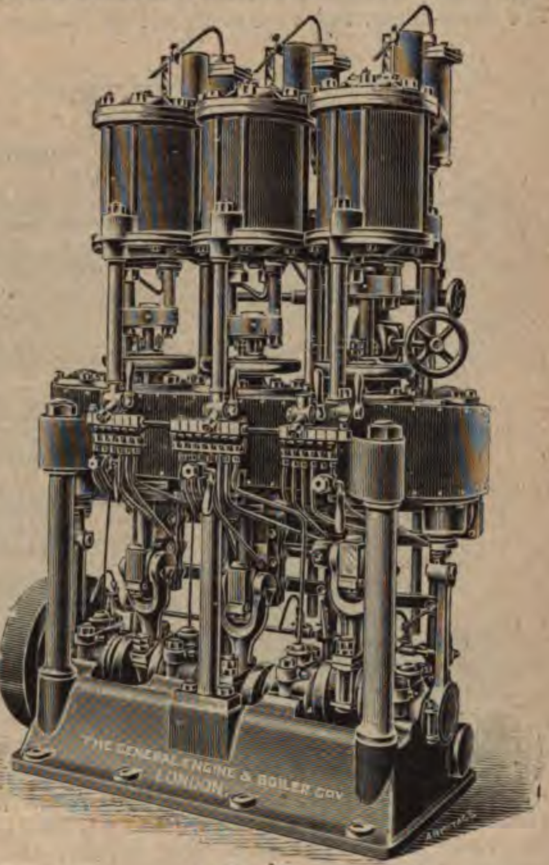

THE GENERAL ENGINE & BOILER COY
LONDON.

Fig. 1.

In this shop is the single-cylinder horizontal engine for driving the shop shafting, which Mr. Northcott designed and had made many years ago, and it does its work smoothly and well. There are two flywheels, one on each side of the crank, and the belt pulley is on the end of the shaft. The present boiler is of the Scotch type; but when trials of the larger engines made by the firm are being made, the boiler is not equal in capacity to the quantity of steam required from it. So the steam has to be shut off from the shop engine. And the shafting is driven by a stand by gas engine. A door behind the two engines leads to the boiler shop. In one part is the Scotch marine type boiler referred to above, and opposite to it is a new water-tube boiler, which has been designed by Mr. Northcott, and is now being built in with brickwork. There is being made for it a long wrought-iron shaft, and the draught will be natural, or forced by steam being introduced to the chimney. The water-tube boiler is of the following shape: There is an upper horizontal steam drum made of cast-steel and a lower water drum parallel to it of the same material. Both drums are parallel to the front of the boiler. These drums are connected with straight tubes of about 1½ in. diameter, rather thickly set together, and expanded at each end into flat tube plates which are bolted on to the drums with steam-tight joints. The angle of the tubes is about 45 deg. The down-comer tubes are of about 5 in. diameter and come down the sides of the boiler from the top drum in a vertical direction, and at the bottom are fitted with steam-tight joints into the feed purifier. The feed-water is pumped into this purifier, and the purifier is connected to the back-water drum by means of a horizontal pipe of about the same diameter as the downcomer. There are two furnace doors. The steam pressure is to be 350 lbs., and the drums have been tested to 600 lbs. hydraulic pressure. We would introduce the feed differently, but the boiler will no doubt do its work well. At the end of this turning shop, compressed air reservoirs, which consist of sets of strong tubes, are being fitted together.

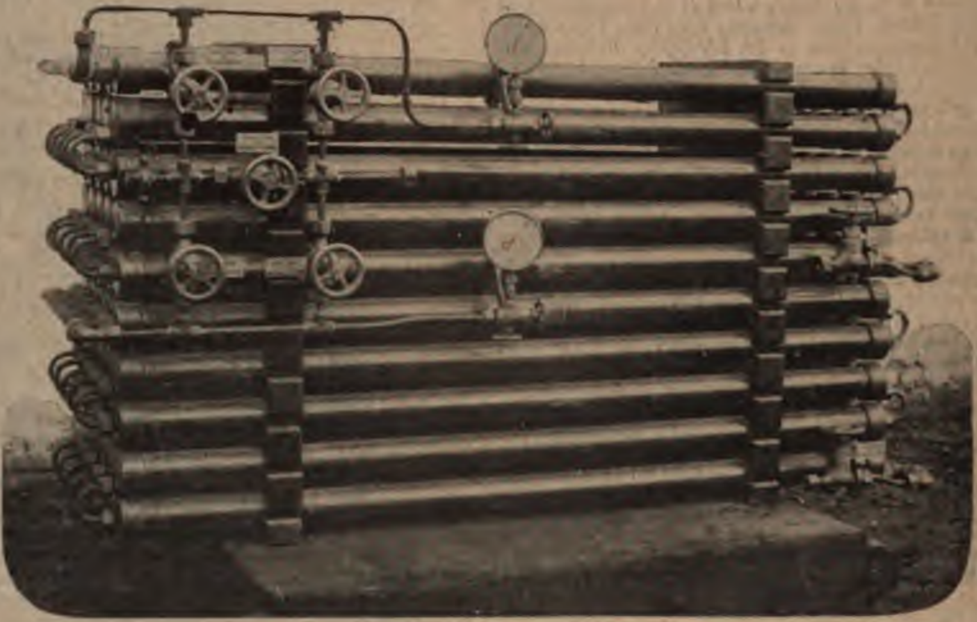


Fig. 2.

The shops are in three main divisions parallel to each other. First is the turning shop already described; then, parallel with that, adjacent and of about the same width, is another section, with large tools and two hand-driven travelling cranes, each capable of lifting 10 tons. In this shop there is a very large turning lathe capable of taking heavy work, and two or three large drilling machines, slotting and planing machines. This shop is mainly used as the erecting shop, and the heavy machines are placed in it for the convenience of being under the cranes, and so to allow the work to be moved easily in and out of them. One or two sets of large air-compressing engines are now being put together in this shop, and there is also in hand 12 sets of air-compressors for torpedo boats under construction for the Admiralty. There is also a series of large filters in process of construction for a Japanese ironclad building in this country. Some refrigerating machinery is also under process of construction for, amongst other ships, H.M.S. *Ariadne*, *Condor*, *Rosario*, *Vengeance*, *Implacable*, *London*, and about a dozen smaller ships.

Beyond this shop is the third of about equal width to the two others. In the upper end of this shop large machines, lathes, shaping, slotting, and planing machines, and a number of repair jobs are being effected on them. At the end of this shop is the forge, in which are a number of fires all fully occupied with forge work. There are also a steam hammer, a gas hammer, and a double Oliver hammer in the forge shop. All castings are brought into the shops from the outside, as the space at the disposal of the company does not admit of room for a moulding shop. The General Engine and Boiler Co. are, however, looking out for a country foundry to acquire.

Above the first shop is the gallery lately brought into use by pressure of work. One side of this is being fitted with American lathes. Some of them are already fixed, and artisans are engaged at cocks and brass fittings for the Admiralty and other work. The other side of the gallery is fitted with benching and engineers' vices suitable for small work. At the end of the gallery is the pattern shop, which is fitted with saws and wood-turning lathes, and at present the pattern-makers are engaged with fairly large work.

We come now to the class of work which is undertaken by the company. We have already referred to the numerous repair jobs which are constantly being brought into the shops, but the main work is for the Admiralty. We give an illustration (Fig. 1) of the triple air-compression engines which the company construct for torpedo service, dynamite gun service, &c. This type of engine is made for delivering air at a pressure of 1,700 lbs. per inch. But the company can make them to deliver air at a pressure of 10,000 lbs. per inch. This type of engine has been fitted into H.M.S. *Cæsar*, *Minerva*, *Venus*, *Diana*, *Juno*, and many other ships, as well as for the H.M. dockyards.

Besides this triple engine the company make a smaller double air-compression engine. This second type of high-speed air-compressor has, in suitable form and size, been fitted into H.M.S. *Calypso*, *Calliope*, *Forth*, *Thames*, *Benbow*, *Edgar*, and many other battleships and torpedo boats. These engines deliver air at a pressure of 1,500 lbs. per sq. inch.

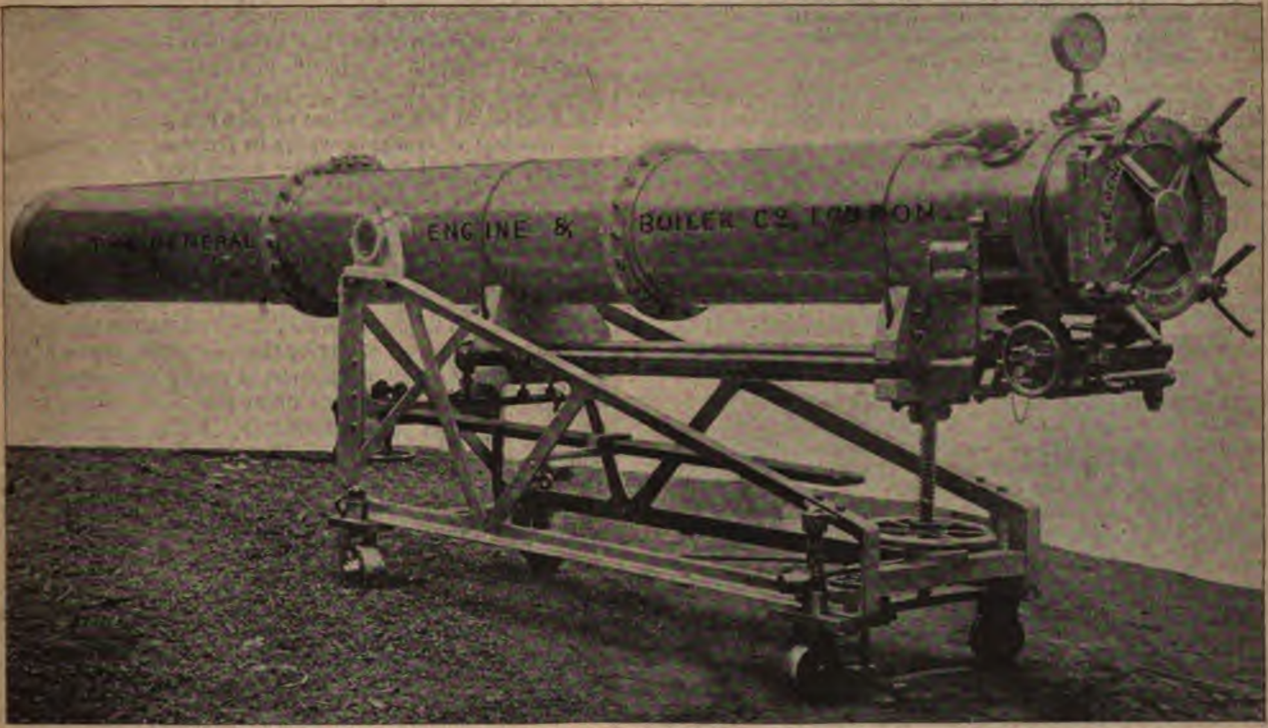


Fig. 3.

We also illustrate (Fig. 2) an air-reservoir as constructed for Whitehead torpedo service. These have been fitted into a number of war ships of all sizes, together with service appliances. The illustration shows a 50-tube reservoir, with stop valves, gauges, &c., complete.

The company also makes a refrigerator, which does its work with cold air. It is claimed for it that it has the advantage over chemical refrigeration of dispensing with costly chemicals and of preventing a stale vitiated atmosphere. They require air and water only. This machine was awarded the first gold medal and special certificate of merit at the Calcutta Exhibition, 1883-4. It then gave an average temperature during the last four or five weeks of the exhibition of about 100 degs. Fahr. below zero.

The company make a central valve engine for electric lighting and other high speed work—also several other types of engine.

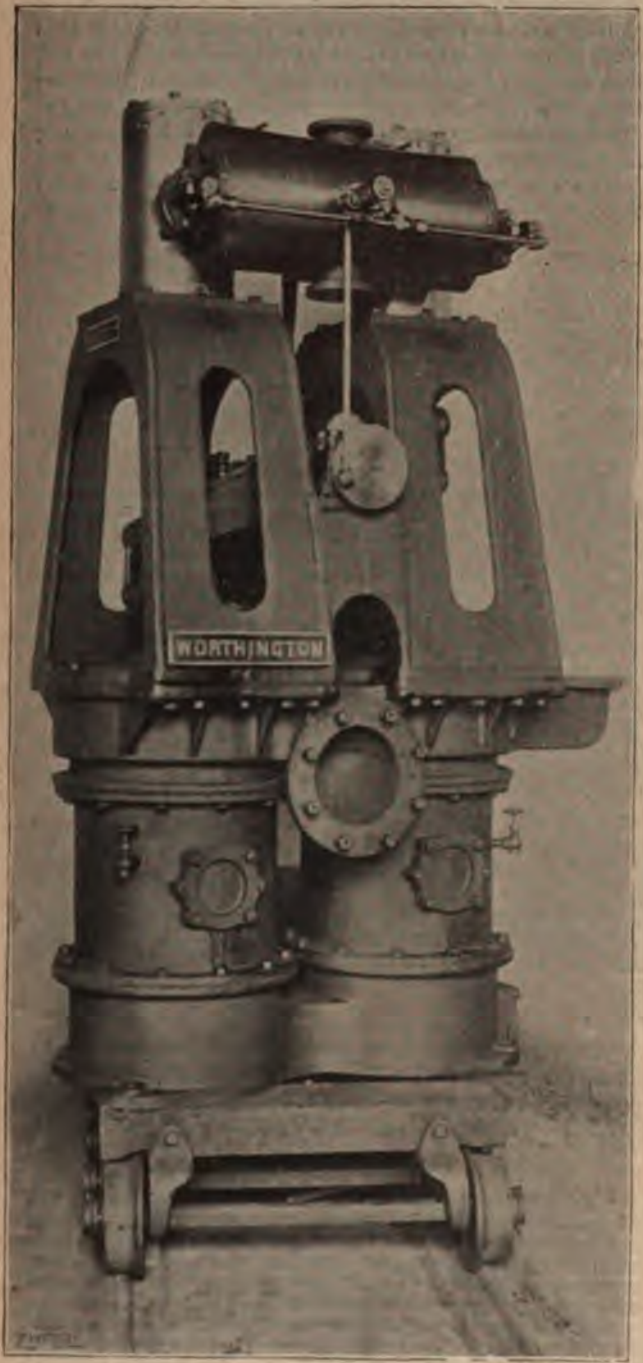
The General Engine and Boiler Co.'s chief speciality, however, may be said to be torpedo gear for the Whitehead torpedo. Besides H.M.S. *Ocean*, *Glory*, *Amphitrite*, *Vengeance*, *Vindictive*, *Formidable*, *Irresistible*, *Aboukir* and *London*, torpedo fittings are in hand for at least a dozen torpedo-boat destroyers. Amongst this class of machinery the General Engine and Boiler Co. make discharging tubes for the torpedo, and we illustrate (Fig. 3) a discharging tube mounted on a sort of gun-carriage and also two discharging tubes for building into the bows of a torpedo boat.

The company was established in 1873, just over 25 years ago, and then, as now, the senior partner in the concern was Mr. W. H. Northcott, for some years a partner of the late Mr. John Bourne, C.E., the well-known engineering author.

Water Meter.—One of the most urgent wants of the age has at last been discovered by Mr. Isaac Smith, M.I.Mech.E., F.S.A., viz., a water meter that will not only accurately register small leakage in valves and taps, but give correct records of consumption under any conditions of water-pressure supply. Ample and severe tests under varied flows and in conjunction with and without one of the best known positive meters prove its absolute correctness and also its principle in accordance with a law-governing water-pressure flows. Its great merits are accuracy, simplicity, durability, and freedom from slip, and the whole apparatus is enclosed in a small compass. These important points render it possible to be placed in every household, so that needless waste, if not stopped, may be charged. An illustrated price list of this ingenious invention can be had from Messrs. Sydney Smith & Sons, Basford Brass Works, Nottingham.

INDEPENDENT AIR-PUMPS.

THE tendency in modern marine engines, especially since the introduction of high-steam pressures and great piston velocities, is to detach all auxiliary pumps, such as the feed, bilge, and circulating pumps from the main engine, and in all cases this plan has been adopted with advantage. The obvious utility of being able to run the various pumps at their own speed, according to requirements independently of that of the main engine, has been so obvious that there is little difference of opinion on the subject.



The attached air-pumps still, however, remain as relics of the old practice, but we are of opinion that the reasoning for utility and convenience in the detachment of the other pumps mentioned applies equally to the air-pumps. Probably this point has not as yet been generally accepted by marine engineers on the specious grounds that the air-pumps are only required when the main engines are running and in proportion to their number of revolutions.

Against this argument we would ask, is there no advantage in starting the main engines upon a perfect vacuum already formed by donkey or independent air-pump engines before the main engines start? If so, the first argument falls to the ground that they are only required whilst the main engine is moving. Again, it is known that the work the air-pumps have to do to maintain a perfect vacuum varies much as compared with the revolutions of the main engines, by reason of the variation of the temperature of the condensing circulating water in tropical or northerly climes, and will further vary according to the range of expansion, or, in other words, the weight of steam passing through the engine per revolution. To provide for these variations the capacity of the attached air-pumps is always made considerably in excess of the minimum requirements to meet the exceptional cases, and, as a consequence, the resistance upon the air-pumps of larger capacity than is necessary is much greater in ordinary work than is really necessary, and produces an excessive call upon the H.P. of the main engines. Even then, therefore, if the argument is good that it is not in itself advantageous to sub-divide the action of the steam in a large number of small cylinders and pistons, rather than take the power from the main engines, yet the above indicated power to vary the work of the air-pumps to meet exceptional circumstances enables a much smaller area of air-pump to be applied, and less power to be required for their operation in ordinary work. Independent air-pumps are also saved from the shock and jar, with consequent carrying away of valves, so often occasioned by the racing of the main engines in bad weather, just at the time when the perfect operation of the condensers and air-pumps is so necessary. The Worthington Pumping Engine Co. have now for some time been introducing a very simple and excellent form of donkey or detached air-pump on the warships of the United States with the best results, and they have further been adopted in England in an electric light installation by reason of their reliability in economy.

We have pleasure in illustrating this pump herewith, which it will be seen is of the vertical beam type, having main steam-moved piston valves operated by rocking valves of the Corliss type. The valve motion of this pump is a feature of special importance. Although it is of the steam-thrown type, it avoids the objectionable feature of inside and inaccessible working parts. The motion for the auxiliary valves is derived from a central disc cast on the end of the main beam shafts.

From a pin on this disc there is a link connecting to a crank on the outside of the steam chest. This crank serves as a tappet arm to throw the cranks operating the auxiliary steam valves.

There are only two stuffing-boxes in this valve motion, and the full power of the engine can be utilized to move the valve spindles should they tend to stick in the packing.

The main beam, while light in appearance and weight, is of cast steel to ensure strength, and the piston and plunger rods are in direct line, transmitting the power directly to the work to be done. The pump valves consist of discs of rubber or composition upon brass seats and controlled by composition springs, and are of the Worthington Admiralty type, which have scored some splendid records in the *St. Louis* and *St. Paul* of 20 to 30 round trips over the Atlantic without a valve being displaced.

It is claimed by the Worthington Co. that these engines, which may be either simple high pressure, or cross compound non-condensing, or compound condensing, have an efficiency as to work done per lb. of steam, equal to that of the best marine main engines, and seeing the smaller dimensions and capacity necessary for them to maintain a perfect vacuum in ordinary work as compared with excess dimensions of the usual attached air pumps, it is claimed that the air pumps will maintain a perfect vacuum with one quarter the H.P. required to drive an equivalent attached air pump.

Even were they only on the same footing of H.P. required for effective working as the attached pumps, the grounds we have before given for the advantages accruing to the safety and efficiency of the engines as a whole by the detachment of air-pumps, would make them worthy of the attention of our marine engineers and shipowners, who want to be in the first flight for economy and efficiency.

The compounding of these engines for greater economy, does not in any way increase the number of parts or valves, or in any way complicate the mechanism, as compared with single-expansion cylinders, and the question of condensation or non-condensation would depend upon the use that might be made of the exhaust steam if non-condensing.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The Claims of Naval Engineers.

THE manifesto issued by the naval engineers has much in it likely to cause argument. The manifesto sets forth all the principal causes of dissatisfaction, and suggests the remedies for them. In the first place, they would like to convert the engineering department of the Navy from a civil to an executive branch for, as, they say, they have no real control in their own department, and no power to award even minor punishments. They would have an engineer officer sit on courts martial when an officer or man of the engineer department is being tried for departmental offences, and also claim a representative on the Admiralty Board. At present they point out the engineering branch has not a single representative on the Admiralty Board, notwithstanding the fact that the engineering department of the Navy includes more than one-third of the total *personnel*. Of course, it is meant by this that not a single naval engineer assists in the deliberations of the Board, the engineers being at present represented in the same way as the other civil branches. The most important claim which is made is that for rank. They would have officers of the Engineer corps rank with the deck officers, according to date of commission. The engineer-in-chief to act as vice-admiral, an engineer officer of the rank of rear-admiral to have a seat on the Admiralty Board; the number of captains R.N.E. to be twenty-five for service at the Admiralty, in the Fleet and Dockyard Reserves, the dockyards, depots, Royal Naval Engineers' College, &c. The manifesto also asks that a parliamentary committee be appointed to inquire into and adjust the pay and retirement of the officers of the corps.

The Prospects of Success.

Of course, no reply can be made to this manifesto by the authorities at Whitehall, and, therefore, the next step will be to obtain a mouthpiece in Parliament, where the matter will be thrashed out. The statement is clear and concise enough, and the remedies for the grievances are also plainly set forth. The engineers have asked for a good deal, more in fact than they probably expect to get. A great deal will depend upon the attitude by the Press, and if the daily and weekly papers deal favourably with the manifesto, much good will result. In some places it is asserted that a number of deck officers, headed by the Sea Lords, stand in the way of reform, and those who make the assertion say that they are prepared to back it up. It would make exceedingly interesting reading if the challenge was made and replied to, because there are a great many deck officers who consider that the grievances of the engineers are just, and there are without doubt numbers who think that the engineers are asking for a great deal too much, and accordingly oppose their claims. The manifesto puts stress upon the combatant and executive nature of the work of the engineers. They compare themselves with the Royal Engineers of the Army, and assert that although a military action could be fought without the services of the Royal Engineers, it would be absolutely impossible for a naval action to be fought without the help of the naval engineering staff. They ask for a full recognition of their class, and a complete reorganisation of the engineering department, in order to enable it to properly fulfil its onerous functions on which the efficiency of the British Navy must so largely depend. The scheme differs from the reforms now being carried out in the Navy of the United States in as far as the British naval engineers do not wish to usurp any of the particular functions of the present executive officers.

Portsmouth Dockyard.

The chief work at this yard is that of refitting and trial-trips. The old *Iris* is to be patched up once more and then is to be placed in the "A" division of the fleet reserve. Over £2,000 is to be spent on her refit, which is to be completed in fourteen days from the time of the commencement of the work. It was expected that the *Orlando* would be out of the dockyard hands at the end of December last, but the date has been changed for the 31st January. The new battleship *London* is still preparing to build, and although the keel plate has not yet been officially laid down, still, some progress is being made with it. At a trial which the torpedo-boat destroyer *Flirt* underwent recently, she maintained the necessary speed for an hour and twenty minutes, but, owing to a leak being discovered in the air pump covers, the trial had to be abandoned. The *Cordelia* has arrived here from the North American station, has paid off, and is to be placed on the Dockyard Reserve. The *Scout*, too, has also paid off.

Chatham Dockyard.

Considerable activity prevails at this yard, and there are many ships completing and preparing for sea. Among the vessels in hand are the battleships *Superb*, *Edinburgh*, and *Dreadnought*, which, as was mentioned before, are undergoing refits, which, include a new supply of auxiliary armaments of improved type. The *Superb*, it is expected, will be completed shortly. Some £11,000 is being spent upon her. The repairs to the *Edinburgh* are almost completed, and when she is ready for sea she will probably be used as a tender to the *Excellent*. The *Dreadnought* is being thoroughly repaired, and is also being fitted with a new set of boilers. Unfortunately her muzzle-loading guns are being retained. The *Warspite* is also refitting, and will soon be ready for the pennant. Then the *Blenheim* and *Pylades* are having their whole 6-in. gun armaments replaced with the new pattern 6-in. quick-firing guns. The cruiser *Mersey* and the torpedo gunboat *Dryad* are also in hand. The battleship *Goliath* is being prepared for sea, and is just about ready for her official trials. The two vessels of the "P" class of cruisers, the *Pactolus* and *Pegasus*, are now quite ready to be placed in the Fleet Reserve. The *Avon* and *Coquette* are being equipped and completed for sea. The *Irresistible*, which was recently launched, was the longest vessel by 10ft. and quite the heaviest of any battleship built and launched at this yard. The second-class cruiser *Astrea* has arrived here to undergo a refit for foreign service. It is proposed to spend some £8,000 upon her.

Reshuffling the Cards.

The step in rank which Sir Frederick Richards has obtained has given general satisfaction. Sir Frederick has rendered the country some most important services during the time he has held the post of First Sea Lord, and it is in recognition of these services that he has been promoted. He will now remain on the active list for a further term of five years, and there is little doubt that the Navy will benefit all round by his retention on the active list. Not that we are in want of able men who could fill the post of First Sea Lord, but it is inexpedient to change horses while crossing the stream, for the war clouds have not yet sufficiently disappeared to warrant a new man at the head of affairs. As a result of Sir Richard's promotion, Admiral Sir R. Tracey and Vice-Admiral Cyprian Bridge both receive a step in rank. The increase in naval *personnel* will also cause some promotion, notably in the cases of Captains Pelham-Aldrich, S. C. Holland, E.N. Rolfe, C.B., A. W. Moore, C.B., C.M.G., A. K. Bickford, and W. A. Dyke-Ackland, who will now become rear-admirals. Of late years cases have occurred of ships being sent to sea under-officered owing to the ships of to-day being much larger and more powerfully armed than they were in the early eighties. An increase in the number of naval engineers might have been expected, and considerable disappointment has been caused by the omission.

The Launch of the "Irresistible."

Two weeks ago the new battleship *Irresistible* was launched from Chatham Dockyard. She is one of three of a new class of battleships which are considered to be improvements of the *Majestic* type. She is a sister ship to the *Formidable* and *Implacable*, completing at Portsmouth and Devonport respectively. The *Irresistible* has a displacement of 15,000 tons, with 15,000 indicated h.p., a speed of 18 knots, is 400 ft. long, has a beam of 75 ft., and a draught of 26 ft. 9 in. The bottom has been coated with Hartman's Rahtjen's Improved Composition (The Red Hand Brand). Her principal armament consists of four 12 in. breech-loaders, twelve 6 in. quickfirers, eighteen 12 pounders, twelve 3-pounders, and eight Maxims. Her complement consists of 750 officers and men. Princess Christian performed the christening ceremony, and was accompanied by Prince Christian and Princess Victoria of Schleswig-Holstein. She is probably the longest battleship ever launched at Chatham, and may also claim to be among the heaviest, her launching weight being more than 5,000 tons. She has also four submerged torpedo tubes fitted to fire 18 in. torpedoes. Several improvements upon the mechanism regulating the supply of ammunition for the guns in the *Majestic* have also been made. The launch was in every way successful, the vessel taking the water easily and gracefully, although she required the assistance of the powerful hydraulic pumps to get her into the water. Princess Christian was presented with a fine drawing of the new battleship, and the polished mallet and the gold plated chisel she had used at the launch. Mr. Goschen, Rear-Admiral Wilson, Admiral of the Fleet, the Earl of Clanwilliam, were among the distinguished visitors present at the launch.

Devonport Dockyard.

Now that the war scare has subsided, things have once again begun to resume their normal appearance. The Channel Squadron has arrived home, and the men have left for their Christmas leave. The *Implacable* still continues to make fairly good progress, and it will not be long before she attains a weight of 5,000 tons, although she has only been building about 4½ months. The launching ways are being prepared, and everything generally are ready for her to take the water. The *Bulwark*, the new battleship which will be built on the slip she vacates, is receiving material in large quantities, and although she will not be commenced on the slip until February next, work on her will be commenced in one of the disused sheds, where her keel-plate will be laid down temporarily. Good progress is being made with the new blocks and officers' quarters in the Royal Naval Barracks. Altogether, there is a pretty extensive programme of work to be got through, so much indeed that the *Partridge* and *Astrea* have had to be sent to other parts to be refitted. The trials of the gunboat *Sheldrake* aroused considerable interest here. The *Sheldrake* has been fitted with the Babcox-Wilcox water-tube boilers, which have cost £32,000, and the results of a trial was most satisfactory. The trial lasted for eight hours, Grant, William H., fleet engineer to the *Vivid*, for the *Temeraire*, the engines developing an I.H.P. of 2,600. She maintained a speed of 18 knots. At her three hours full-power trial the engines developed an I.H.P. of 4,050, with a speed of 20½ knots per hour, the coal consumption working out at 1½ lbs. per I.H.P. per hour. The gunboats *Magpie* and *Ridbreast* return home from the West Coast of Africa and East Indies' Station respectively in the Spring to refit at this yard.

"The Sailors' Friend."

Seamen of all grades, bluejackets, stokers, and marines, should feel considerable satisfaction and gratification at the honour the Queen did Miss Agnes Weston, when she received her in the early part of last month. Some twenty-five years has elapsed since Miss Agnes Weston commenced her excellent work, which is at the present day so much appreciated by our seamen. A good word should also be put in for her fellow worker, Miss Wintz. Many old bluejackets will remember Miss Weston's back kitchen in Stoke, where she first started dispensing her charity by providing meals at cheap rates for Navy men; but, at the present day, two great "Rests" at Devonport and Portsmouth respectively have taken its place. Each of these buildings has cost more than £100,000 to erect and furnish. Miss Weston's supporters are not confined to England. She receives much of the help which is given to her from the Colonies, and even from America. Miss Weston conducts these "Rests" on temperance principles, and it is the sympathy which she has extended to the seamen, and the great common sense which she has brought to bear upon the conduct of these places, that has made them such an unqualified success. She recently announced what she called her silver wedding with Miss Wintz in that bright little publication *Ashore and Afloat*, and although she asked for nothing for herself, she intimates that £5,000 is still needed for the extension and completion of her "Rests." Seamen will not need to be reminded how much they owe to her. No adequate reward could be given her for the work she has done for the Navy, and it is to be hoped that her silver wedding gift will equal, or more than equal, her expectations.

Improving the United States' Navy.

Considerable activity is said to prevail in all the departments of the United States' Navy at present, and new schemes are constantly being brought forward for improving it in every way. A correspondent of the *Standard* says that every ship in the North Atlantic fleet has been supplied with a full allowance of smokeless powder, and that there are sufficient projectiles of all kinds in hand to outfit every ship five times over. The reserve supply is being steadily increased. In some target work which has been carried on lately scores were made which beat all previous records in the American gunnery. The battleship *Texas* is stated to have gained the distinction of taking the first honours in this work. The Navy Department has definitely decided to adopt Krupp armour for the battleships and cruisers recently authorized by Congress, the armour protection of which is to be carried from the water-line up to the main deck. The Elswick 50-calibre 6-in. guns, which form part of the armaments of the new cruiser *Orleans*, built at Elswick, have excited the admiration of all American officers, but as the target work of late shows 40-calibre American 6-in. guns to be fully up to the Elswick pieces, the United States' authorities do not intend at present to exceed the 40-calibre as a standard. Using the new smokeless powder, 3,000-ft. seconds velocities are readily obtained with the American weapon. In future, when American ships are cleared for action, all woodwork is to be removed, and the new orders require the stripping of the cabin, ward-room, and forward officers' rooms of every bit of furniture. Even bunks are to be done away with, and the officers are to sleep in hammocks during the times of actual fighting. If the present activity continues, permanent good must result to the United States' fleets.

Pembroke Dockyard.

The Royal yacht is the centre of activity at this yard. Additional hands have been drafted from the *Spartiate*, and some 900 men are at present busy upon her. It is said that the Duke and Duchess of York intend to take a trip round the world in her in the autumn. Whether there is any truth for this statement is doubtful. Overtime, too, is being resorted to, in order to get the vessel into an advanced stage. The new cruiser which is to be laid down here has not yet been commenced However, the slip is being got ready for her commencement. Fair progress is being made with the *Spartiate*, which will afford employment for numbers of hands for some time to come.

Italian Naval Matters.

The Italian naval Budget was the cause of a rather spirited discussion in the Chamber of Deputies. Some of the deputies are said to have represented the conditions of the Italian as being worse now than in 1874, when the great effort was made to increase Italy's naval strength. The instalments which were voted for the construction of new ships were : For the *Saint Bon*, 4,000,000 lire; for the *Emanuele Filiberto* 3,100,000; for the *Vettor Pisani*, 1,350,000; for the new *Garibaldi* (to replace the *Garibaldi* sold to the Argentine Republic last summer) 1,800,000: for the new *Varese* 1,650,000; for the *Puglia*, recently launched, 700,000: for the *Agerdat*, 850,000, for the *Coatit*, 660,000; for the *Benedetto Brin*, and the *Regina Margherita*, 2,100,000 each, for the *Ferruccio*, 1,770,000, and for nine torpedo boats and other small vessels, the total sum of about 4,000,000 lire. Admiral Palumbo made a long speech on the subject of Italian Naval progress in the course of which he said that Italian engineers had constantly taken the lead in introducing improvements, but that other nations after adopting these improvements, had outdistanced Italy in the amount of money they could expend in applying them. He declared that Italy's fleet was now an assortment of examples rather than a homogeneous whole. The vessels, the *Regina Margherita*, an ironclad cruiser, and the *Benedetto Brin*, an armour plated cruiser are shortly to be laid down at La Spezzia and Castellamare respectively, and of these Admiral Palumbo says that they represent the highest expression of contemporary naval science, but if their construction, like that of the *Puglia*, is allowed to drag on for years, they will be quite out of date before they take their place in the fighting fleet. Another armour-plated cruiser which will probably be named the *Principessa Elena*, is to be laid down at Venice. Plans have also been prepared for the construction of an armour-plated cruiser of 7,400 tons, to be named the *Francesco Ferruccio*, and a protected cruiser of the *Puglia* type will also be commenced shortly. The *Regina Margherita* will be 433 ft. 4 ins. long, by 94 ft. 4 in. beam. Her mean draught will be 27 ft. 6 in. and she will have a displacement of 12,765 tons. She will be fitted with four-cylinder triple-expansion engines supplied with steam from water-tube boilers, and she is to steam at the rate of 20 knots an hour with natural draught.

Rewards for Service in Crete.

At the end of the recent troublous times in Crete came the news that several well-deserved rewards and promotions had been given to various officers who had done duty there, for the parts they had played in the drama. The promotion of Commander P. Vaughan Lewes, D.S.O., is certainly well deserved. It is now twenty and a-half years since he entered the Navy, and he is fortunate in being promoted to commander after such a comparatively short length of time. Lieutenant Nicholson also fully deserves the distinguished service order, which is his reward for heroic service rendered at Candia in September last, when a party had to be landed from the *Hazard* to quell a serious disturbance which had broken out. The most notable reward of all is that given to Surgeon W. A. Maillard, of the *Hazard*, for his gallantry at Candia on the same occasion as that in which Lieutenant Nicholson so distinguished himself. He has been awarded the Victoria Cross. He is the first naval surgeon to win such a coveted prize. Admiral Noel's secretary, Assistant Paymaster A. R. Parker, also receives his step in promotion. In the opinion of many, Admiral Noel's reward is a poor one compared with the work he has done, for he has practically performed the task upon which the skill of all the chief diplomatists of Europe was brought to bear in vain.

The Trials of the "Argonaut" and "Andromeda."

The result of the steam trials of the first-class cruiser *Andromeda*, which have just been completed, has been most satisfactory. On her eight hours' full-power trial the mean speed of the four runs on the measured mile was 20·41 knots, with a coal consumption of only 1·76 lbs. per unit of power per hour. The draught of water forward was 24 ft. 3 in., and aft 26 ft. 3 in.; the steam in boilers was 285 lbs., and at the engines 245 lbs., the vacuum being 26½ starboard and 115·6 port; the mean I.H.P. was 16,781, which produced 118·8 revolutions starboard and 115·6 port. The first-class cruiser *Argonaut* has also completed her steam trials, which have been highly successful. The average I.H.P. on her full-power trial was 18,894, with a speed of 21·17 knots, and a coal consumption of 1·62 per unit of power per hour, both the power and speed being in excess of that required of he On a thirty hours' coal consumption trial at an I.H.P. of 3,600 the following results were obtained :—Draught of water forward 24 ft. 3 in., aft 26 ft. 3 in.; speed, 13·3 knots; steam in boilers, 258 lbs.; vacuum, 25·8 starboard, 26·2 port; revolutions per minute, 75·5 starboard, 76·3 port; mean I.H.P., 1,922 starboard, 1,893 port. Total, 3,815; coal consumption, 2·02 lbs. per I.H.P. per hour. The *Andromeda* is the first vessel of the *Spartiate* class to undergo her trials, and the *Argonaut* is one of four vessels of another class, to which the *Diadem*, *Europa*, and *Niobe* belong.

The French Navy Estimates.

According to the Navy Estimates which have just been made public, the money it is proposed to expend upon the French Navy for 1899 amounts to 304,078,400 francs, which is practically an increase of more than 17,000,000 francs over and above that spent during 1898. Nearly half of this additional money is to be spent upon materiel, but there is also to be an addition to the personnel, towards which part of this increase is to be devoted. The shipbuilding programme of the French Navy, it will be remembered, consists of one battleship, two armoured cruisers, two cruisers of a new class, two destroyers, 15 torpedo boats, and six submarine boats. A good deal of the proposed expenditure for 1899 will be devoted to the refitting and modernising of many old battleships and cruisers. For instance, Belleville boilers are to be fitted up in the *Hoche*, and Niclausse boilers in the *Requin*, and modern guns are to replace the old ones of the latter vessel. New guns and boilers will also be supplied to the *Terrible*, *Furieux*, *Devastation*, and the *Indomptable* and *Caiman* are to have new guns. Considerable structural alterations are also to be made in the *Marceau*, *Magenta*, and *Neptune*, and *Admiral Duperre*. The number of new vessels to be completed in this or succeeding years is 108, but 18 of these are almost completed. The *D'Entrecasteaux*, it will be remembered, recently broke down during a trial prior to her leaving for the China station as flagship, and had to put back to Toulon for repairs. The ironclad *St. Louis*, the armour-plated cruiser *D'Entrecasteaux*, and the first-class cruiser *Chateaurenault* will either be completed this month or in the course of the next year. The third-class cruisers *Infernet* and *D'Estrees* are to be completed by June and August respectively. The principal vessels which are to be completed in the course of 1900 includes the ironclad *Henri IV.* and *Jena*, and the first-class cruisers *Jurien de la Graviere* and *Zelee*. In 1901 the ironclad *Saffren* and the ironclad-cruisers *Jeanne d'Arc*, *Dupetit*, *Thouars*, *Gueydon*, *Montcalm*, *Dessaix*, and *Kleber* will also be prepared for sea. In 1902 the armoured cruisers *Conde*, *Gloire* *Dupleix*, and *Sully* will be completed.

Sheerness Dockyard.

There is an abundance of work at this yard, and a good deal of overtime has had to be resorted to in order to keep abreast of it. Considerable progress has been made with the new sloops *Condor* and *Rosario* (recently floated out), which are to be got ready for their trials as rapidly as possible. The *Vestal* and *Sheerwater*, which are to take their places in the dock, are also receiving some attention. Orders for two similar sloops have just been placed with Laird Brothers, Birkenhead. They are to be named the *Mutine* and *Renaldo*. They are slightly larger than the *Condor* and *Rosario*, but will be built on similar lines. The two vessels together will cost £130,000, and an effort will be made to have them ready for sea in twelve months' time. They are to be rigged with two masts, on which will be fitted platforms for the mounting of machine guns, as they are primarily intended for river duty. The *Buzzard* has left this yard for service on the North American and West Indian station. Her refit has cost upwards of £14,000,

A New Calibre Gun for the Navy.

The wisdom of the step which, it is said, the Admiralty propose taking in introducing a new calibre gun into the Navy, has called forth much adverse comment. It is only a rumour at present, but since the cruisers built for foreign powers at Elswick have been armed with the 8-in. gun, there have been many who have thought that the adoption of such a gun by the British Navy would have been advantageous. On the other hand, there are many who take exception to the rumour, and assert that there are many disadvantages which should be taken into consideration. A writer in the *Times* points out that there are already in the service guns of 16¼ in., 13½ in., 12 in., 10 in., 9·2 in., 6 in., 5 in., 4·7 in., and 3 in. calibres, exclusive of smaller natures, and of a considerable number of R.L.M. guns, which still, unfortunately, encumber some of our warships. Of the above guns, he says, the 16¼ in., 13½ in., and 10 in. will not probably be repeated, and a simplification of our too complex arrangements seemed, therefore, to be within reach of accomplishment. By introducing an 8-in., or, as seems more likely, a new 7½ in. gun, this simplification will be retarded. On the other hand, many naval students are in favour of the change. Mr. Sydney Lowe, writing in the *Pall Mall Gazette*, considers that it is the gun which will decide the fate of sea battles in the future as in the past, and particularly the 6 in. and 8 in. Where two opponents are in other respects on a level, says he, that one which can bring to bear an extra half dozen of such weapons has a fair chance of proving the conqueror. But these expressions of civilian opinion do not represent the opinion of naval experts, to whom the question of choosing the right gun for the Navy should be left.

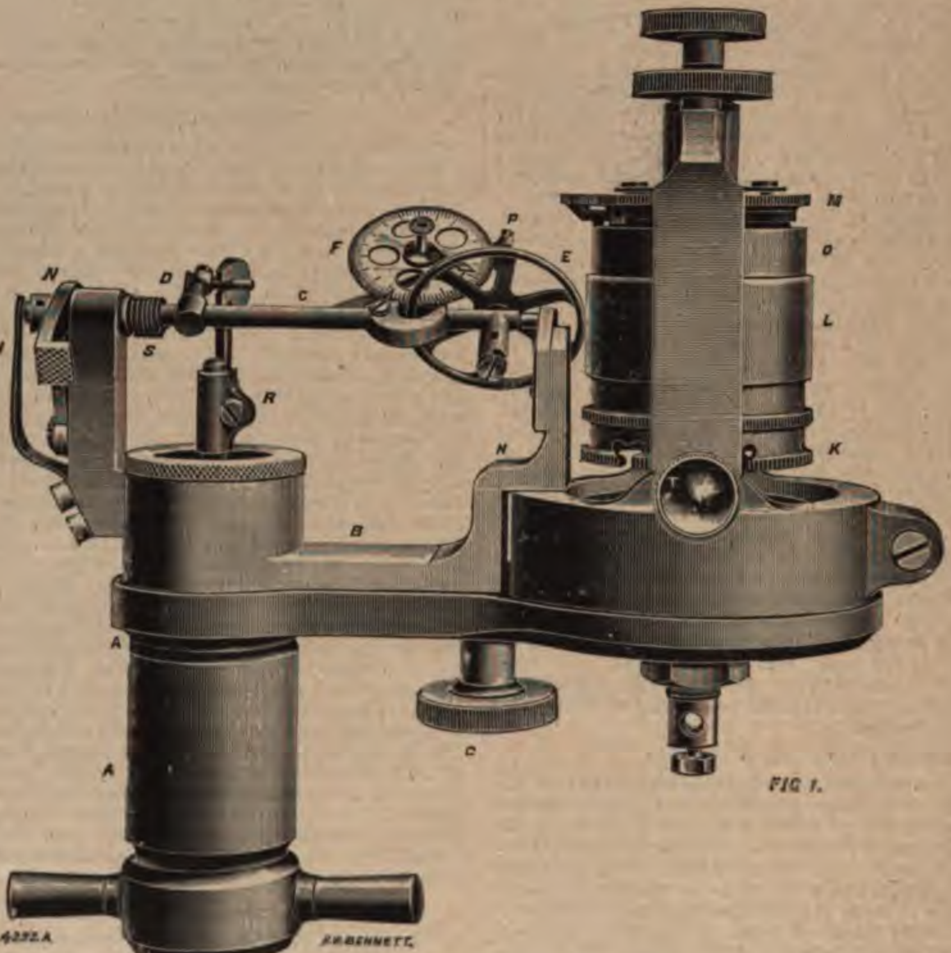


FIG 1.

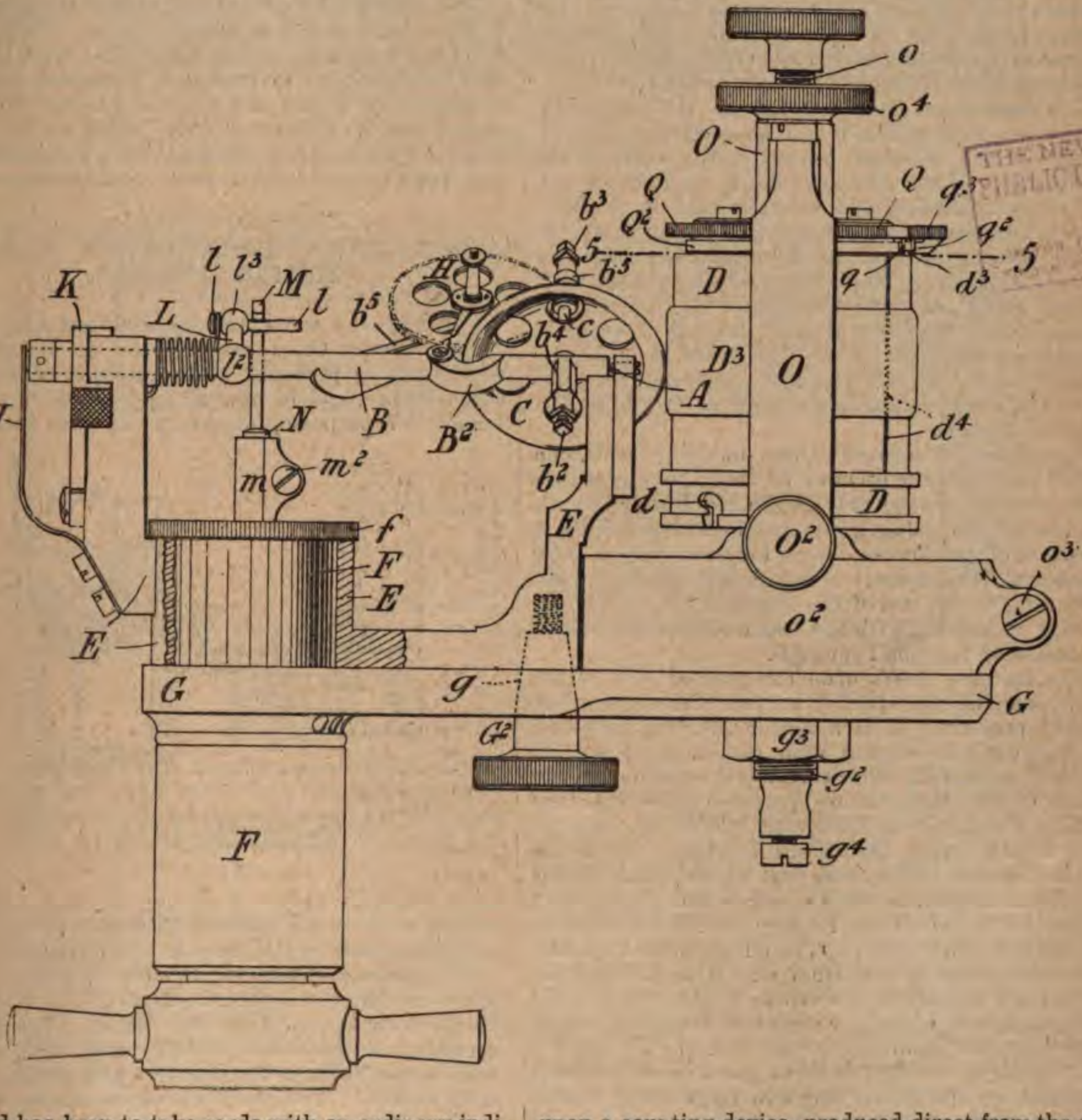
Little's Continuous Recording Indicator.

The Insurance of British Commerce.

A careful study of the Parliamentary paper recently issued by the Board of Trade, showing the relative expenditure on the Navies of the various European Powers as compared with the mercantile interests, reveals that the British empire pays less for the protection of her mercantile interests than any other country. The report deals with the year 1896-97, and during that time the amount spent on the British Navy was nearly twenty-four and a half millions sterling, and the aggregate tonnage in ships of the Mercantile Marine, which it was the duty of the Navy to guard, was ten and a quarter millions. The imports for that year were valued at six hundred and seventy-two millions sterling, and exports five hundred and thirty-seven millions. France, with a tonnage in merchant ships of 920,871, spent over ten and a half millions; Russia, with a Mercantile Marine of 577,207 tons, spent nearly six millions, which, it will be seen, is about a quarter of the amount spent on the British Navy wherewith to protect only one-twentieth of our tonnage. Germany, it appears, has a Mercantile Marine of close upon 1,500,000 tons, and she spends nearly as much as Russia upon her Navy. The United States, according to the paper, has a Mercantile Marine of 805,584 tons, and six and a half millions sterling was spent on the Navy in the year in question. From these figures it will be seen that the amount spent upon the British Navy is much smaller in proportion to the extent of her commerce than that of any other Power.

LITTLE'S CONTINUOUS RECORDING INDICATOR.

A WANT has been felt for a long time for a reliable and efficient device which will give the aggregation of continuous measurements of work or energy, applicable to the recording of the power given out by an engine over an extended period of time. The usual method has been to take cards with an ordinary indicator at definite intervals, and the resulting records have been taken as an average for the period of time involved. This may or may not give an approximately correct result, according to circumstances, and now it is generally thought that unless the records are very carefully taken, and surrounding circumstances correctly noted, when deducing the final result, little reliance can be placed upon it.



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We have pleasure in placing before our readers the illustrations and description of a very ingenious instrument, which is capable of integrating continuously the work done in the cylinder of an engine under all conditions of varying load. This is the invention of Mr. W. G. Little and Mr. C. W. G. Little, of Bexley, Kent, and is manufactured by the former.

It may be said that the instrument is a combination of an ordinary indicator with a planimeter, and is so constructed that a continuous record is made upon a counting device, produced direct from the axis of the planimeter wheel, whereby the aggregation of all the separate measurements is effected and recorded on the counting device as the sum of the records for any given time, irrespective of the absence of any records of revolutions or steam pressures. The action of the instrument may be regarded as that of a planimeter, in which the inclination of the planimeter wheel is produced by the varying pressures of steam on the indicator piston, and in such a way that the amount of rotation of the wheel is proportional to the steam pressure producing such inclination. The instrument may be regarded as a planimeter, the wheel of which is fixed, and which, by turning on its edge, takes those inclinations which would be imparted to it in the ordinary way by tracing the pointer round the diagram, whilst the diagram card in contact with it is reciprocated through a distance equal to the length of the diagram. As the inclination of the planimeter wheel is produced, when tracing a diagram, by a combination of vertical and horizontal motions of the tracing pointer, so in this instrument the proper amount of inclination of the wheel is imparted to it by a sine motion produced by a pin and a slot.

This instrument is illustrated in the adjoining illustration, from which it will be seen that A is the cylinder of the indicator containing the usual spring and piston. B is a carriage sliding on to the upper part of the cylinder, and securely held in position upon the bracket of the instrument by the screw G, which on being screwed home brings the axis of the drum O at right angles. C is a shaft provided with a rigid arm P, carrying the counter F and one pivot of the axis of the wheel E, the other end of which is pivotted on the shaft itself. The wheel E is dished to allow of the forward bearing H being brought close up to the contact slide L of the drum O and in line with the shaft C.

The counter F consists of two toothed wheels, one of 100 teeth and the other of 99 teeth, both engaging with a worm on the axis of the planimeter wheel, the upper one being graduated in 100 divisions, a simple and well-known device for recording a large number of revolutions. D is a crank, carrying a pin I, working in the slot of the crosshead R, which pin is kept in contact with the lower surface of the slot by means of the small spring S.

The spring I bears upon the pointed end of the shaft, keeping the wheel in contact with the drum at a fixed pressure. N is a rocker enabling the wheel to be placed in contact with the drum or not, at will. The frame K is for carrying the bearings of the drum O, the latter being provided with a hollow spindle which can be filled with oil for the lubrication of the upper and lower bearings, which are conical centres. The lower part of the frame is split and fits accurately over the spring-box on the bracket; it can be tightened up in any desired position by means of a single screw. The milled head T forms a removable stop to the drum O. M is a device for accurately measuring the stroke of the drum while in motion, and which, by means of a vernier, can be read to 1 two-hundredths of an inch.

This device consists of three parts, a centre piece attached to the frame and two rings fitting around it, each being provided with a tooth on the lower side, one ring being graduated, the other carrying the vernier. The upper edge of the drum is provided with a similar tooth, at the same distance from the centre, which contacts with those on the rings and causes them to set themselves apart by an amount equal to the stroke of the vernier, and thus records accurately the amount of its rotation. L is a hard brass sleeve, which can be slid up and down to allow a change of contact surface if necessary; but as the pressure of the wheel upon the slide is very slight, a great number of revolutions can be made upon one place before the line of contact can be detected even by the finger-nail, and the instrument will continue to record accurately for an almost indefinite length of time.

The drum is driven in the usual manner by a cord from some reciprocating part of the engine, the instrument being screwed on to the cylinder fitting as usual.

We understand that some of these instruments are in the hands of the naval authorities at Chatham, who have found them very accurate. A set of them have been supplied to Professor Alexander Kennedy for testing the high-speed engines driving the dynamos of the Waterloo and City Railway. We await with interest the results obtained from this instrument from trials extending over some considerable period.

COWPER-COLES RECUPERATIVE ELECTRO-ZINCING PROCESS.

We have on some previous occasions noticed the Cowper-Coles regenerative or recuperative electro-zincing process. This process is coming into extensive use, and is now being utilised for a great number of purposes, especially for the coating of torpedo-boat destroyers and the tubes of water-tube boilers, such as the Belleville, the zinc being applied externally, that is, the fire side, not internally.

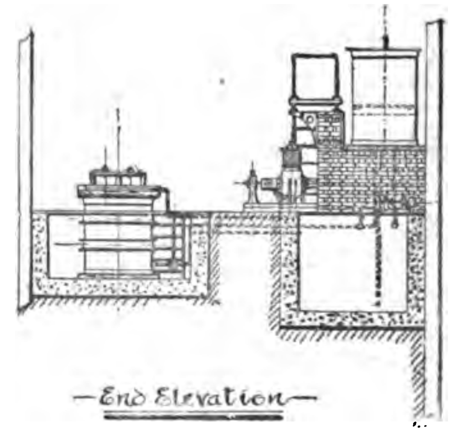
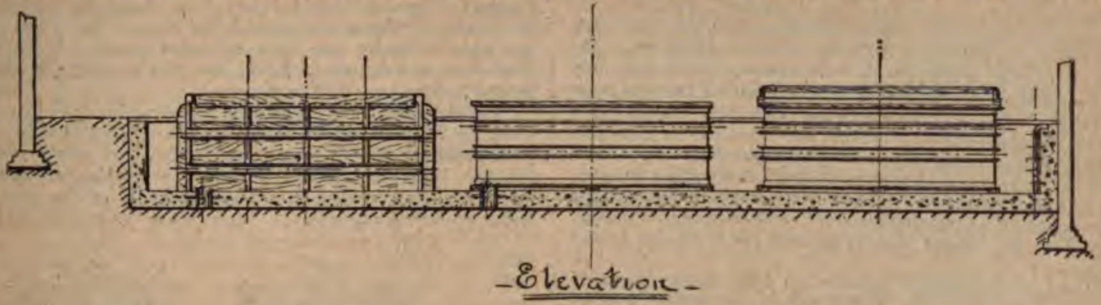
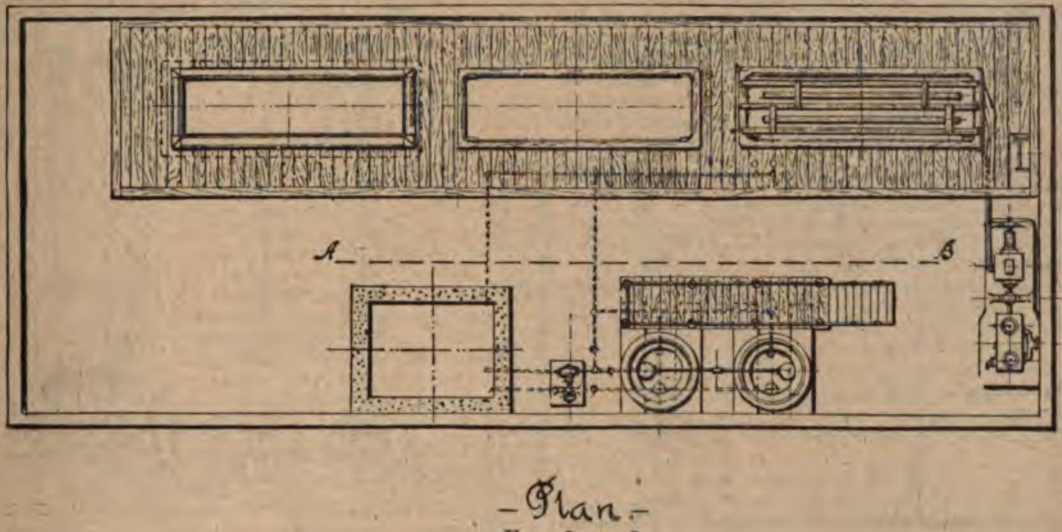


FIG. 1.

We illustrate (Figs. 1, 2, 3, and 4) a plant which has been designed for the Germania Shipbuilding and Engineering Co. at Tegel, near Berlin. The plant is specially constructed for coating tubes, such as those used in the Thornycroft, Yarrow, and similar water-tube boilers. The plant shown is arranged to be worked by a motor-transformer, giving on the low tension side 3,000 amperes at 6 volts, the current being conveyed to the tanks by means of bare copper strips. The anode and cathode bars are constructed as shown in Figs. 5, 6, and 7. This arrangement effects a great economy in the first cost of the plant, and has the additional advantage of allowing the electrodes to be brought closer together. It also facilitates the handling and removal of the articles to be zinced. Both the electro-zincing tanks and the regenerating tanks are made of iron, the solution being continuously circulated by means of a small air-compressor. The zinc dust in the regenerators is placed on a framework of wood, which is covered with cocoanut matting and a layer of cindes, the zinc dust having been previously mixed with some finely-ground carbon. The electrolyte contains 35 oz. of crystallized zinc sulphate per gallon, the amount of free acid per gallon not exceeding 1-10th oz. The regenerated electrolyte enters at the bottom of the zincing tank, the liquid which is returned to the regenerators being drawn off from the top of the solution over a wood-sill placed in a corner of the zincing vat.





Figs. 2 and 3.

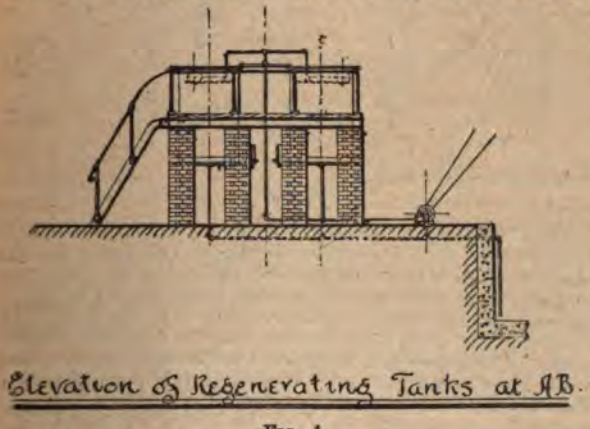


Fig. 4

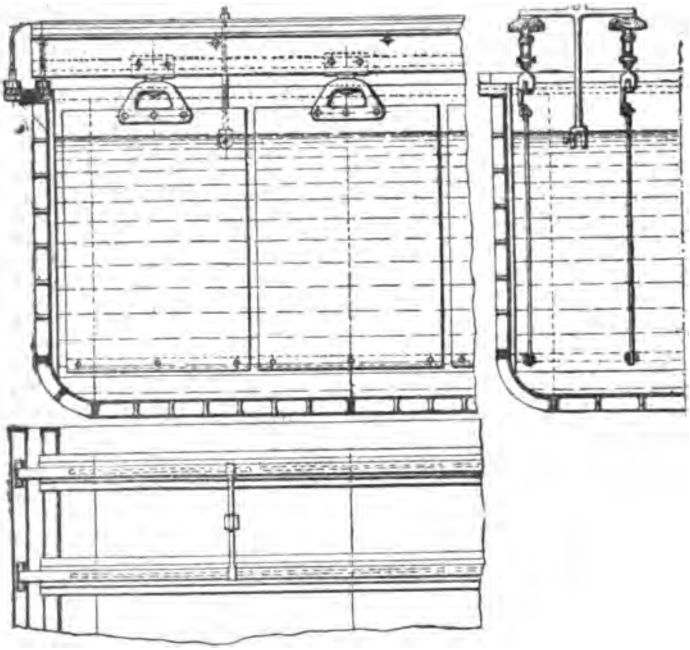
Figs. 8, 9, 10 and 11, illustrate the Cowper-Coles apparatus for coating tubes both internally and externally. The zincing solution is circulated through the internal anode marked G and returns on the outside of the tube through the pipe A^2 to the regenerating tanks. The tube is caused to revolve rapidly in the electrolyte by means of toothed wheels J^2, fitted at the top of the zincing pit, the electrolyte being briskly circulated through the inside of the tube, and then over the outside of the tube. The lead lining of the zincing pit forms the anode for coating the outside of the tube, and the lead-covered pipe G forms the internal anode, being perforated as shown at G for the passage through the electrolyte. The electrolyte enters through the holder C, which is hollow, the interior of the zincing pit being connected by a passage C through the bearing and the top of the vessel A^2, which acts as a reservoir.

Limari.—The new passenger steamer *Limari* arrived at Valparaiso after a satisfactory passage of 38 days. She is the latest addition to the extensive fleet of the Compania sud Americana de Vapores of Valparaiso, and will be employed in their passenger and mail services between the southern ports of the West Coast of South America and Panama. This fine vessel, like many others belonging to the company, was constructed by Messrs. John Reid & Co., Limited, shipbuilders, Whiteinch, Glasgow, her engines being supplied by Messrs. Dunsmuir & Jackson, engineers, Govan. Both hull and machinery were put together under the superintendence of Mr. Thomas Dewsbury, of Leeds.

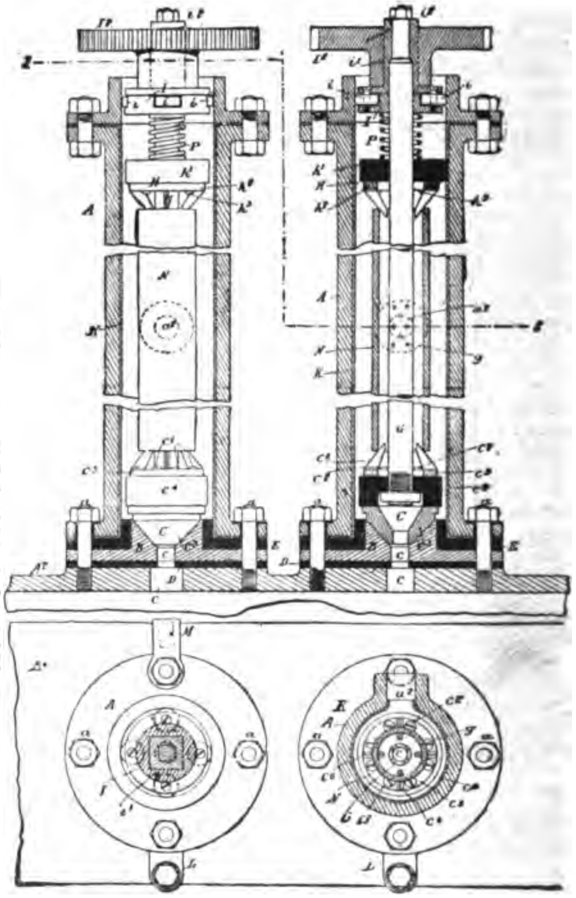
MARINE ENGINEERS' NOTES.

THE conversazione is announced to take place on the 20th January, when Dr. Inglis, the President, will give his address. As before noted in these columns, this address being the first in the new decade, it will be looked forward to by the members to give an indication of what new developments may be expected in the next ten years. In the former Notes the hope was expressed that Dr. Inglis might see his way to inaugurate a department of experimental research, but that is too late now. That department has already been inaugurated by Mr. Adamson's offer to provide the apparatus for further investigation into the question of circulation. Since then there have been other offers to assist in other directions of research, and all that is required of Dr. Inglis now is to add his influence to the movement.

The paper on feed-water heaters has had its due share of notice in the technical press in the country, mainly because of the theory of the live steam feed-water heater being taken up and a solution offered by the author. This question has been before the country now for some fifteen years, and indeed it has puzzled many investigators. The difficulty lay in it being assumed that only heat came into the water by the steam which came from the boiler. Engineers did not consider that heat might go into the water in consequence of the better circulation of the water in the boiler. Better circulation means more rapid movement of the water over the heating surfaces, and the author asserts that this causes a more rapid absorption of heat coming through the plates. It was The Engineer which first directed attention to this, affording the explanation of the better economy, and it is now seen to be borne out by experiment.



Figs. 5, 6, 7.



Figs. 8, 9, 10, 11.

Cowper-Coles Recuperative Electro-Zincing Process.

However that may be, its importance to the Institute of Marine Engineers lies in the fact that the members will now take part in investigations of engineering problems. There will be difficulties in the way to begin with. Those who were interested with technical instruction funds preferred that it should be spent in other directions. It is not said they were wrong when they resolved to do this—it is only said that marine engineering work was not advanced by what they did. Very many of the members of this Institute are under the County Council of Essex. What has the County Council of Essex done for the advancement of their cause or the cause of marine engineering? Essex has an extensive sea coast. It has engineering firms which hold a very high place in the engineering work of the world. Some of them are famous for boiler work. What has the County Council of Essex done for the advancement of boiler construction? All that has been done, notwithstanding the thousands of pounds which the Government has handed over to Essex, has been done by private persons out of their own pockets. We could tell a funny story about the interest which the County of Essex has taken in the matter, but it would not be fair since it hardly ever does any good to tell. It is expected that when the county of Essex has the matter placed clearly before it something will be done.

Take this feed-water question. The experiments made on the *Oriel* by The Engineer, were the first which definitely proved a clear economy of fuel by the use of the live steam feed-water heater. Was this done by technical instruction money? Not a bit of it. Take these last investigations on the new Palace steamer *La Marguerite*; were these arranged under any technical instruction system? Not they. Technical instruction systems were very busy with other things. One had to go to the superintendent engineer of the new Palace steamers to get the soft side of the chief engineer to get at the stoker and the captain before anything could be done. But the thing is wholly English. The official departments paid for doing work do not do it, and what they do is not always the most useful.

But there is one point not wholly cleared up in the proofs shown by the experiments. The funnel temperatures as taken during the experiments on board *La Marguerite* did not show any change due to the feed-heater being off or on. This, however, was probably due to the kind of stoking, and the changing of the height of the damper door, which limited or advanced the consumption of coal. The temperature of the funnel therefore was not properly given as a factor depending on the work done in the boiler, and so did not prove in the least whether the circulation influenced the quantity of heat taken through the plates to the water or not. The experiments made by Mr.

Yarrow for other purposes supplied better proof because they showed that the circulation did affect the funnel temperature. In what way did those experiments prove this? They did it when the functions of the boiler were done separately, and when they were done together. When both functions were performed together, the funnel temperature was so much; when the functions of heating the water up to boiling and evaporation were done separately, the temperature of the funnel was on the average 70 deg. to 80 deg. lower.

Sir John Durston always contributes something very valuable to the Institute of Marine Engineers, when he sends anything at all. The engineering department of the Admiralty never was in so forward a state than it has been since Sir John took the reins into his own hands. The Navy has been fitted out with water-tube boilers since Sir John came into office as Engineer-in-Chief. He has given every boiler-making firm of any note an opportunity of doing its best by fitting their boilers into some vessel. It has been his policy not to put all his eggs into one basket. He has aimed at creating a healthy competition in the country amongst boiler-making firms with the very best results. It appears as if this were his policy all round. In his communication bearing on the education of marine engineers he says: "For many years the Admiralty trained their own engineer officers exclusively, but since 1890 a proportion, usually about a quarter of the annual entries, has consisted of gentlemen who have received their professional education at private establishments, the object in view being to induce a healthy rivalry between engineer officers who have been trained by the Admiralty and those who have received their education outside the Admiralty, and also to prevent the Admiralty system of training from falling into a groove from want of practical means of comparison with the results obtained by the technical colleges and private workshops of the country. At Keyham the training extends over five years. . . . Sports of all kinds are arranged, the object of the Admiralty being to produce good engineers, mentally and physically. After five years outside and inside, candidates are examined for probationary assistant engineers. Those who obtain a certain percentage of marks are selected for a more advanced course of study at the Royal Naval College, Greenwich. . . . The two or three men at the top of the list are given a thorough mathematical and physical course of instruction, and officers so trained, after they have acquired sufficient sea-going experience, not less than three years, are eligible for posts at the Admiralty and dockyards in connection with the design and construction of machinery and boilers for the Royal Navy. Outside candidates "must have at least 4½ years training in approved workshops and technical colleges, and must also be between the ages of 20 and 23." It will thus be seen from the above that the engineering department of the Admiralty not only has a mind of its own but, whether it be in the department of education or in boilermaking, its policy is to obtain all that is best in the country for the nation's good. One of the speakers at the same meeting advocated the same policy for the Institution and spoke of creating a friendly rivalry between kindred institutions. He said, "Institutions like the Marine Engineers' in England and Shipbuilders' in Scotland and the Naval Architects had these investigations as a part of their work. Most of the members of the Naval Architects had facilities for investigations. Many members of the Engineers' and Shipbuilders' possess also facilities, but there was nothing of the kind as yet in connection with the Marine Engineers. . . . There ought to be a friendly rivalry between the several engineering institutions throughout the country. It ought to be the aim of each of them to further the interests of scientific investigation. At the Royal Institution there was the old laboratory in which Michael Faraday spent the best years of his life, and discovered all the laws which govern the construction of electric lighting machinery. He submitted that the Institute of Marine Engineers was powerful enough to provide apparatus for the original investigation into the laws which govern marine engineering."

Messrs. Bell, Thompson & Co., of 32, Irwell Chambers, East Fazakerley Street, Liverpool, inform us that they have been appointed agents for the Tyne Brass & Copper Tube Manufacturing Co., Jarrow-on-Tyne, makers of seamless and brazed brass and copper tubes for locomotive and marine engines, surface condensers, yellow solder, &c.

ELECTRICAL NOTES.

(From our own Correspondent.)

EVERY engineer is familiar with the P. & O. electric lighting set of Messrs. Siemens, but it is seldom one comes across so neat and light an electric lighting set as that of the Sturtevant Co., furnished for the torpedo-boat service of the U.S. Navy. The engine has a cylinder 2 in. by 2 in. The steam is admitted through a special form of throttling governor, capable of controlling the speed of the engine. The engine is designed to work at 200 lbs. pressure at 1,000 revolutions, and indicate 3 H.P. The specified limit of weight was 500 lbs., and the capacity 1·5 kilowatt. The finished machine weighed 400 lbs., and so the weight is at the rate of ·266 lbs. per watt. To keep the centre low a fine pole machine with two fixed coils was designed. The field magnet is of wrought iron, the pole pieces being bolted to it. The armature is of the two circuit fine pole barrel wound type without cross-connection. These brush-holders are of the reaction type. The generator is compound wound for a constant e.m.f. under all changes of load. The *Electrical Engineer*, New York, gives the above particulars.

The Holland Submarine Boat.—This boat has been reported on by the Board of Inspection to the Navy Department of the United States. The report says that the boat is all which the makers claim for it; that it can descend and rise perfectly under the control of the man at the throttle valve. But the report goes on to say there ought to be a test under war conditions. The war test will be over and under a mile course. In the centre will be anchored an old vessel, at which the *Holland* must discharge a torpedo and then sink beneath the surface. It will depend on the success of this test whether the Government of the United States will accept the *Holland*.

The development of the islands taken over by the United States—Cuba, the Philippines, Porto Rico, is of considerable interest in shipping circles, but the terms imposed by the States looks as if trade with the Western islands was about prohibited to Great Britain. At Porto Rico the rain makes the roads almost impassable to transport wagons, and as there is no coal but plenty of water power, General Stone advises the construction of a network of light electric railways. This will be a new field for electrical firms in the States to exploit, and they will no doubt soon do it.

They were most interesting demonstrations which Professor Lodge brought before the Institution of Electrical Engineers illustrative of his system of wireless telegraphy. Wireless telegraphy depends on one system of electrical disturbances in a circuit disturbing the circuit of another system at a distance. The disturbance may be very slight, but it can be increased until it is much louder than the voice. He explained that rapid magnetic alternation induces an alternating electrostatic field, and is accompanied by emission of energy, but slow alternations practically allow all the energy to return to the source. Some time ago he read a paper on resonators, and caused one or two of different harmonics to respond to one. So with Leyden jars. He made two similar jars, provided each with suitable circuits to respond to one another at a distance. It was only a step farther to replace the Leyden jars by condensers of several microfarads capacity, and the resonating metallic loops into induction coils of large area laid horizontally, and an alternating current dynamo takes the place of the influence machine. At the Institute, Great George Street, the alternations were obtained from the companies' street mains, and three large coils of wire were arranged on the lecture table. The disturbance was received by the condensers and passed on through a system of four. At the first the disturbance could only be detected by the experimenter, at the second the audience became acquainted with it, while at the fourth a loud sound was produced.

In France they have the Heilmann electric locomotive, a huge affair weighing 120 tons. It has a boiler, Willans engines, and dynamo and motor attached. Notwithstanding the roundabout way of getting to the application of the power it is claimed that there is an economy. There is no friction due to oscillating parts as in the ordinary locomotive. In marine work it is becoming more and more a system to work at least gun machinery with electric motors, and they have been found far more efficient than hydraulic or steam actuated machines. It may be expected that the system will soon be applied to pumps, hoists, etc., as separate motors for these machines would work much more efficiently, and be much less in the way than steam pipes. The Goulds Manufacturing Co. of Seneca Falls, N.Y., have arranged a good triplex pump with a motor base geared to be driven by a motor. It is constructed to pump to an elevation of 100 ft. The motor base maintains the correct relative position of pump and motor. The gearing is machine cut, the gears are of iron, and pinions of steel bronze or rawhide.

A new process of electrical soldering has been patented in the United States. It consists in first heating the metallic parts to be joined together in a furnace to the soldering temperature. The pieces are then placed in the electrolytic bath, as used by Lagrange and Hoho, and then submitted to compression in a powerful press. The pieces to be soldered are withdrawn in the bath from the negative pole of an electric source, the currents being allowed but a short time to act on the metal, which soon becomes of a soldering whiteness. When this takes place the pieces are pressed, when a complete adhesion takes place. The current is only used during the time it is necessary for soldering the metals.

There is a new system of dynamo construction in the United States on the three-wire system, which is well worth the consideration of Marine Engineers. The machines is of the multipolar type with single armature winding single commutator. The fields are excited by a modification of the multi-circuit system, invented by Mr. Rushmore, in his multi-voltage dynamos. At the Rushmore works there runs a 30 kilowatt machine supplying a three-wire system. It delivers its output at 220 volts, or at 110 volts, and one side may have a load of 75 per cent. of the total kilowatt capacity of the machine without interference with the other side, which may or may not be loaded. The brushes are fixed, and there is no sparking. One side of the system may be kept constant at any voltage, and the other raised or lowered to any extent without the least interference. We are indebted to the *Electrical Review*, N.Y., for the description of this new machine.

A company is being promoted in New York City with a capital of 1,000,000 to build and operate a tide-water plant. The promoter is Mr. Thomas Edison junr., who has devised the plans for the machinery. The plant will consist of two metal pipes, 15 ft. in diameter and 100 ft. in length. These pipes will be pivoted in the middle and made to act as walking-beams through an automatic device actuated by the water flowing through them. The ends of these pipe walking-beams will be made to operate the piston rods of compressed air cylinders. The compressed air will be used for triple expansion engines which will operate dynamos. The plant will be reversible, that is, capable of operating whether the tide is running in or out.

The *Electrical Review* contains a useful article on "Electrical Canal Haulage." It discusses the several systems and says in 1892, electrical traction was tried on the patent of M. Galliot upon the canal of the Bourgogne. A kind of electrical tricycle was employed, and the cable was fixed behind between the motor wheels. The motor is bipolar of 6 kilowatt. The shaft gives motion by a bronze worm to a wheel on the axle of the driving wheels which are of iron, wrapped in fibre, for elasticity and grip. The machine carries a light cab, in which the driver controls it. It weighs two tons. The system by Lamb, consists of electrical motors running on cables and hauling boats, as in the previous system. A strong cable is carried on posts on the bank. A carriage runs on this cable, carrying a motor which drives a wheel by means of a worm. Round this wheel is once wound a second or traction cable. The haulage rope is attached to this carriage. The two cables are so isolated as to serve for conductors. The worm runs in an oil bath, with very little friction. The motor can be driven from deck by means of suitable wires carried on the haulage cable, or there may be a driver seated on a suspended seat from the motor itself.

Messrs. James Howden & Co., who have now removed to their new works and offices at 195, Scotland Street, Glasgow, which have been erected for the better carrying out of their forced draught specialties, are very busy, the amount of work done during the past year being considerably more than in any previous year. Nearly all the cargo steamers now built use their patent system of forced draught, which is also being used in almost every first-class passenger liner; the ships which will, when completed, be the largest and fastest steamers in the world being amongst their later contracts.

BABCOCK AND WILCOX.

In the year 1856 Mr. Wilcox designed a water-tube boiler, and it has not been much departed from in the present shape of the Babcock and Wilcox of this year 1898. It has, therefore, had an unbroken life. In this country it has been adopted almost exclusively as the water-tube boiler for electric lighting stations, and there is no other being used in the Mercantile Marine of the English lines. In the United States of America it has been fitted into several vessels of the Navy, and many cargo vessels.

The suitability of this type of boiler for marine purposes is shown by the fact that the Wilson Line, of Hull, have seven ships fitted with them, working in the ordinary passenger and cargo service, and have recently placed the order for another. They are also fitted in vessels which are employed in the coal trade, ships which are only a few hours in port, when no time can be spared to give special attention to the boilers.

Among the ships which have been fitted with this type of boiler are vessels employed in ordinary tramp service, making voyages to all parts of the world, and it is certainly a proof of the reliance placed in these boilers to find that a small sand pumping dredger, having these boilers installed, has recently steamed from the Clyde to New South Wales in 80 days, although only built for a speed of 8 knots.

In *Cassell's Magazine* for July, and in a number of American journals since, reference was made to the performance of the U.S. *Oregon* and the gunboat *Marietta*, in steaming from the western coast of America round the Horn to Cuba, a feat of long-distance steaming which has not been surpassed.

The *Marietta* was built by the Union Iron Works of San Francisco, and is fitted with two Babcock and Wilcox boilers. On the trip from San Francisco to Key West she was in company with the battleship *Oregon*, and she steamed at an average of a knot per hour above her ordinary speed over the whole distance.

It was not found necessary during the voyage to slow or stop on account of, or to make any repairs whatever to the boiler. As might be expected, after such a voyage the furnace fronts needed relining, but this was not absolutely requisite, and the only order for material received by the boiler builders was for firebricks. After recoaling at Key West the *Marietta* immediately took her place with the squadron, and was afterwards engaged in active service.

It is claimed by some engineers that water-tube boilers do not stand hard sea duty but it must be admitted by the sceptical that this is an instance of a type which has been weighed in the balance and has not been found wanting when steam was required.

The ease and length of time required to remove a tube in one of these boilers is given in a report submitted to the Chief of the Bureau of Steam Engineering in America by a board of engineers appointed to examine into the merits of the Babcock and Wilcox marine boiler, which states as follows:—

After the test was completed the fires were banked and the water blown out. Two workmen with two helpers then split both ends of a lower tube, drew it out, put in a new one—expanded it—and replaced the caps ready for working in 22½ minutes.

Boilers of this type have been installed in the U.S. monitors, *Manhattan*, *Mahopac*, and *Cannonicus*, in the cruisers *Chicago* and *Atlanta*, and in the gunboats *Murietta* and *Annapolis*.

Messrs. Wilson's, of Hull, lately completed the trials of the s.s. *Truro*, which is the seventh vessel of their line fitted with these boilers. The following is the engineer's report of these trials :—

The coal used was Scotch, the consumption calculations are made on the average I.H.P.

The feed-water remained perfectly steady all day. No priming was observed. A satisfactory accumulation trial was made during the day. No flaming was observed at the funnel mouth. The adjustable baffles were regulated to obtain the best combustion with the least amount of smoke, the best results being obtained when the ratio of baffle opening to grate area was as 1 : 12.

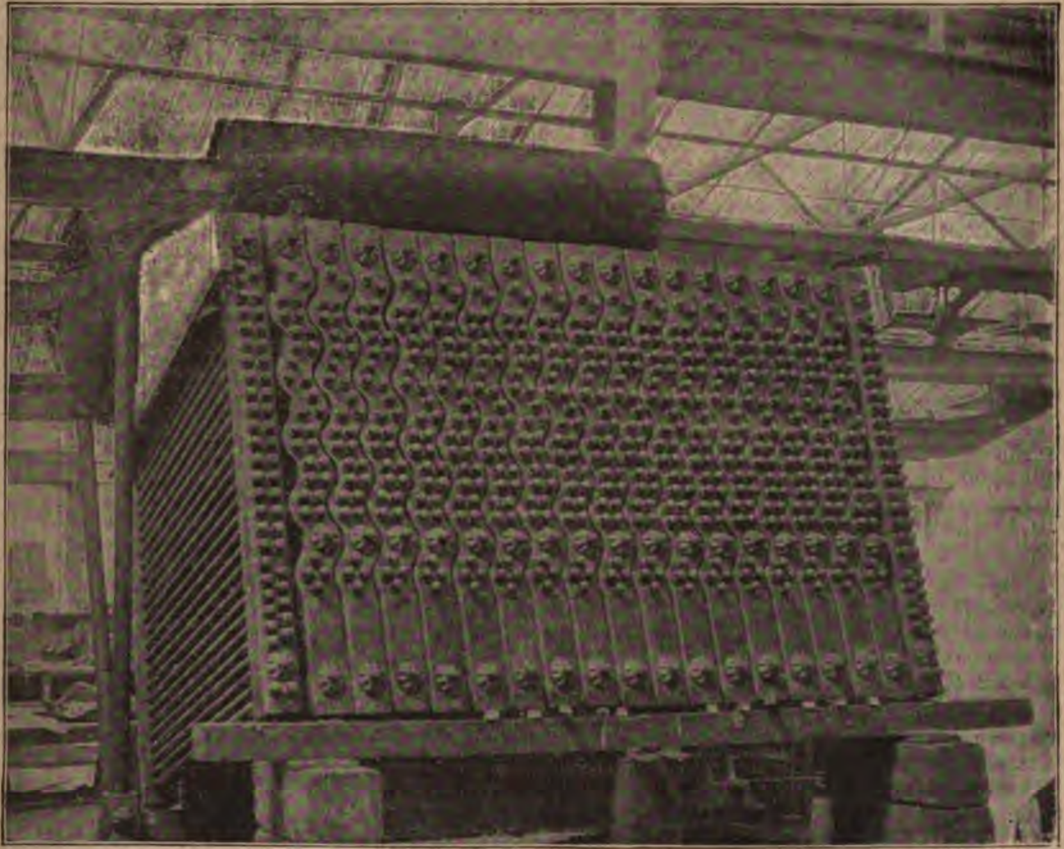


Fig. 1.

Total heating surface	5,500 sq. ft.
Total grate area	117 „
Ratio of H.S. to G.A.	47 : 1
Baffle opening	9·75
Ratio B.O. to G.A.	1 : 12
Average lbs. of coal per hour...	2,100 lbs.
Average lbs. ash per hour	100 „
Average lbs. combustible per hour ...	2,000 „
Maximum I.H.P.	1,564
Average I.H.P...	1,415
Lbs. of coal per I.H.P. per hour	1·48
Lbs. combustible per I.H.P. per hour ...	1·41
Lbs. coal per sq. ft. of grate	18
Average funnel temperature	600 deg.
Average speed in knots	13·8
Average revolutions	110
Temperature of feed-water	145 deg.
Pressure of steam in boiler	225 lbs.
„ „ in H.P. casing	220 „
„ „ in I.M.P. casing ...	96 „
„ „ in L.P. casing	20 „
Vacuum	24 ins.
Percentage of ash	5 %

As regards the cost of up-keep, it is stated that it is a common thing for boilers of this discription to run for a whole year without having a single tube renewed, and the boilers in the *Zenith City*—one of the largest cargo vessels trading on the Great Lakes —of 2,000 H.P., only cost her owners 35 dollars per boiler for repairs during the year 1897.

Messrs. Babcock & Wilcox have just installed eight boilers in a large dredger for the Russian Government, two boilers for the corvette *Ellida*, and four boilers in H.M.S. *Sheldrake*. They have also been installed in many passenger and cargo steamers, tugs, yachts, and dredgers. The S.S. *Turret Cape* has been working very satisfactorily with these boilers; her consumption of coal has been 15½ tons per day, her deadweight 3,121 tons, her speed is from 9 knots to 10 knots, and the I.H.P. 830. H.M. torpedo gunboat *Sheldrake* has just completed a series of interesting trials of her boilers. The basin trials of this vessel took place at Devonport on 14th, 15th, 16th and 17th November, and the sea trials were carried out off Plymouth on 28th November and 1st December. There are four boilers on this ship, having a collective heating surface of 9,424 sq. ft., and a total grate area of 252 sq. ft. The I.H.P. obtained on the sea trials was 4,050, with a consumption of 25 lbs. of coal per sq. ft. of grate per hour with half-inch air pressure in the ash pits. With this I.H.P. the vessel obtained a speed of 20·6 knots per hour, and on a coal consumption of 1·57 lbs. per I.H.P. per hour. When burning only 15 lbs. per sq. ft. of grate the average I.H.P. was 2,642, and the speed obtained with this H.P. was 17·9 knots per hour. The coal consumed per I.H.P. was 1·47 lbs. This result is in accordance with the opinion expressed here long ago. We said at the time that the result of this trial would be sure to come out very satisfactorily, and a coal consumption of 1·47 lbs. per I.H.P. is very satisfactory indeed.

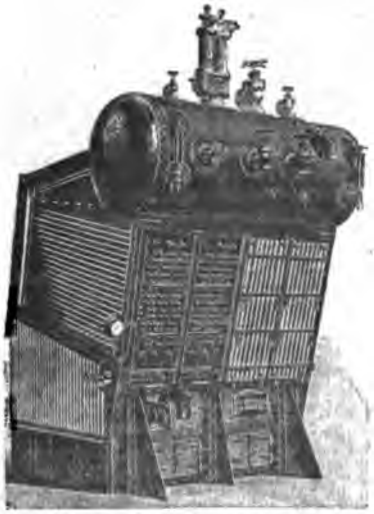


FIG. 2.

We give two illustrations of the newest marine type of Babcock & Wilcox boilers. Fig. 1 giving an excellent view of the heaters, and the other, Fig. 2, the side view.

The Marine Engineer's Guide to the Board of Trade's Examinations for Certificates of Competency. London: Crosby, Lockwood & Co., 1898.

A very excellent guide which will enable a candidate to coach himself, and to fear no examiner, is here produced. The papers set for the examinations for certificates have been exhaustively worked through. Questions set have been extracted, and a key to the proper and accurate working out of them provided. The book throughout seems business-like and thorough. It is provided with an excellent index and clear diagrams. The only point that we have to make adversely to the book is to be found on the first page of the text, where a reference is made to the Merchant Shipping Act of 1862, as that under which these examinations for certificates of competency for Marine Engineers are compulsory. The error, if error it be, is but after all a technical one. The Act of 1862 did institute these examinations and make the possession of certificates necessary for them upon whom they are now obligatory. But the Merchant Shipping Act was consolidated in 1894, and the examinations in question are now held under the 92nd and following sections of that Act, the Act of 1862 being superseded. As the preface is dated 24th August, 1898, the change might have been noticed. But the point is a lawyer's and not an engineer's.

Summary of Shipbuilding Returns of United Kingdom in 1898, arranged in order of Tonnage built by each Firm.

	Name of Firm.	Place.	No. of Ships.	Total Tons.
1	Wm. Gray & Co., Ltd	Hartlepool	27	72,328
2	C. S. Swan & Hunter	Tyne	18	68,696
3	Harland & Wolff, Ltd	Belfast	7	67,905
4	Sir W. G. Armstrong, Whitworth & Co., Ltd	Tyne	15	54,379
5	Workman, Clark & Co.	Belfast	9	53,475
6	Russell & Co	Clyde	18	44,551
7	Ropner & Son	Tees	14	43,647
8	Palmer's Shipbuilding Co.	Tyne	8	41,824
9	J. L. Thompson & Sons, Ltd.	Wear	12	41,056
10	Wm. Denny & Bros	Clyde	21	35,800
11	Fairfield Shipbldg. Co., Ltd.	Clyde	7	35,108
12	Clydebank Engineering and Shipbuilding Co., Ltd	Clyde	8	34,500
13	Sir James Laing & Sons, Ltd.	Wear	8	34,280
14	Wm. Doxford & Son, Ltd.	Wear	9	33,464
15	Sir Raylton Dixon & Co., Ltd.	Tees	10	33,292
16	Richardson, Duck & Co.	Tees	11	33,011
17	Furness, Withy & Co., Ltd	Hartlepool	7	32,396
18	Wm. Hamilton & Co.	Clyde	9	32,017
19	Short Bros.	Wear	10	31,161
20	Charles Connell & Co	Clyde	6	29,220
21	Thames Iron Works and Shipbuilding Co., Ltd	Thames	2	27,800
22	Wigham Richardson & Co	Tyne	9	27,320
23	J. Readhead & Sons	Tyne	8	26,708
24	A. Stephen & Sons	Clyde	5	24,418
25	Vickers, Sons & Maxim, Ltd.	Barrow	5	24,079
26	D. & W. Henderson & Co	Clyde	8	23,298
27	Barclay, Curle & Co., Ltd	Clyde	7	20,700
28	Robert Thompson & Sons	Wear	8	19,655
29	R. Stephenson & Co., Ltd	Tyne	8	19,525
30	J. Blumer & Co.	Wear	7	19,447
31	Scott & Co.	Greenock	9	19,307
32	Hawthorn, Leslie & Co., Ltd.	Tyne	10	18,807
33	John Priestman & Co	Wear	6	18,650
34	Earle's Shipbuilding Co., Ltd.	Humber	25	17,915
35	A. Rodger & Co.	Clyde	8	17,797
36	Bartram & Sons	Wear	5	17,151
37	Craig, Taylor & Co	Tees	6	17,004
38	W. Dobson & Co	Tyne	5	16,837
39	R. Craggs & Sons	Tees	7	16,168
40	Tyne Iron Shipbdg. Co., Ltd.	Tyne	6	15,802
41	Sunderland Shipbuilding Co.	Wear	5	15,191
42	W. Pickersgill & Sons	Wear	5	14,990
43	Caird & Co., Ltd	Clyde	4	14,677
44	Irvine's Shipbuilding and Dry Docks Co., Ltd	Hartlepool	5	14,321
45	R. Napier & Sons	Clyde	4	14,150
46	A. McMillan & Son, Ltd	Clyde	4	12,510
47	London and Glasgow Shipbuilding Co.	Clyde	8	10,997
48	Ramage & Ferguson, Ltd	Leith	7	10,267
49	R. Duncan & Co.	Clyde	6	10,095
50	S. P. Austin & Son, Ltd	Wear	6	10,029
51	Simons & Co., Ltd.	Clyde	10	9,850
52	Wood, Skinner & Co., Ltd	Tyne	9	9,742
53	Lobnitz & Co. Ltd.	Renfrew	17	9,387
54	John Reid & Co., Ltd	Clyde	10	8,925
55	Grangemouth Dockyard Co.	Grangemouth	7	8,050
56	A. W. Robertson & Co.	Thames	80	8,035
57	Carmichael, Maclean & Co.	Greenock	11	7,084
58	T. Turnbull & Sons	Whitby	5	7,006
59	Mackie & Thomson	Clyde	40	6,941
60	Gourlay Bros. & Co.	Dundee	5	6,700
61	Campbeltown Shipbuilding Co	Campbeltown	4	6,434
62	Caledon Shipbuilding and Engineering Co. Ltd.	Dundee	6	6,232
63	Blyth Shipbuilding Co., Ltd.	Blyth	8	6,076
64	John Scott & Co.	Kinghorn	4	6,022
65	Ailsa Shipbuilding Co.	Troon	9	5,847
66	Cochrane & Cooper	Beverley	30	5,489
67	Edwards Bros.	Tyne	32	5,185
68	Osbourne, Graham & Co	Wear	1	4,697
69	Hall, Russell & Co.	Aberdeen	9	4,080
70	Fleming & Ferguson, Ltd	Paisley	7	3,750

LIST OF VESSELS LAUNCHED IN 1898.

ENGLISH.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
By R. Craggs & Sons, Middlesbro' and Stockton-on-Tees.					
† Pilgrim	Steel	Steam	British	4,295	1,800
† Fernhurst.. ..	,,	,,	,,	819	550
† Royal Exchange..	,,	,,	,,	2,108	1,150
† Silurian	,,	,,	,,	940	650
† Earlswood ..	,,	,,	,,	2,353	1,210
† Broadgarth ..	,,	,,	,,	3,300	1,500
† Brookwood ..	,,	,,	,,	2,353	1,210
By Craig, Taylor & Co., Thornaby-on-Tees.					
† Wladimir Sawin..	Steel	Steam	Foreign	2,057	800
† Sylviana	,,	,,	British	4,187	1,800
† Mayflower ..	,,	,,	,,	4,188	2,020
† Claverdale ..	,,	,,	,,	3,350	1,100
† Primo	,,	,,	,,	1,372	850
† Greenhill	,,	,,	,,	1,850	1,100
By Irvine's Shipbuilding & Dry Docks Co., Ltd., West Hartlepool.					
† Edenhall	Steel	Steam	British	2,572	1,000
† Glencoe	,,	,,	,,	2,560	1,000
† Laura	,,	,,	,,	2,795	1,200
† Winifred	,,	,,	,,	2,794	1,200
† Bergenhus ..	,,	,,	Foreign	3,600	1,400
By W. H. Lean, Falmouth.					
* Cory	Wood	Steam	British	36	175
By G. Napier & Son, Cross House Engineering Works, Southampton.					
* Kestrel	Steel	Steam	British	75	77
* Hobby	,,	,,	,,	75	77
* Constant	,,	,,	,,	85	120
By Osbourne, Graham & Co., Hylton, Sunderland.					
† Glosterhill ..	Steel	Steam	British	1,247	125
† Thyra	,,	,,	Foreign	3,800	260
By Penarth Shipbuilding Co., Penarth.					
* Eirene	Steel	Steam	British	67	130
By Wm. Pickersgill & Sons, Southwick, Sunderland.					
† Kildonan	Steel	Steam	British	2,118	900
† Ullapool	,,	,,	,,	3,601	1,500
† Richmond Castle	,,	,,	,,	3,605	1,500
† Frances Holland	,,	,,	,,	2,061	900
† Corby Castle ..	,,	,,	,,	3,605	1,500
By T. G. Tagg & Son, East Molesey, Surrey.					
* Alabama IV. ..	Wood	Steam	British	18	80
‡ No. 128	,,	,,	,,	6	35
By Thames Iron Works & Shipbuilding Co., Ltd., Blackwall.					
† H.M.S. Albion ..	Steel	Steam	British	12,950	13,500
† I.J.B. Shikishima	,,	,,	Foreign	14,850	14,500
By Union Co-operative Shipbuilding Co., Blyth.					
* Rambler	Wood	Steam	British	91	170
* Ranger	,,	,,	,,	91	175
* Prudhoe Castle ..	,,	,,	,,	91	170
By Wm. White & Sons, West Cowes, Isle of Wight.					
* Chanticleer ..	Composite	Steam	British	67	167
* Ferry launch ..	Wood	,,	,,	30	30
* 9 Admiralty cutters	,,	,,	,,	—	252
By Willoughby Bros., Ltd., Plymouth.					
* Privateer	Steel	Steam	British	107	70
* Despatch	,,	,,	,,	75	37
* Lady Beatrice ..	,,	,,	,,	110	40
By Allsup & Co., Ltd., Caledonian Foundry, Strand Road, Preston.					
Kittiwake.. ..	Steel, &c.	Sail	British	200	—
† Kimu	Steel	Steam	,,	385	700

* Compound. † Triple. ‡ High Pressure.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
By R. Williamson & Son, Workington, Cumberland.					
* Lodes	Steel	Steam	British	396	600
† Volscian	,,	,,	,,	616	700
* Luddick	,,	,,	,,	520	700
* Rock Channel ..	,,	,,	,,	430	600
4 barges	,,	Sail	,,	540	—
By Sir W. G. Armstrong, Whitworth & Co., Ltd., Newcastle-on-Tyne.					
Asama	Steel	Steam	Foreign	9,700	18,000
Tokiwa	,,	,,	,,	9,700	18,000
4th July	,,	,,	—	4,560	14,750
Hai Chi	,,	,,	Foreign	4,500	17,000
Don Carlos ..	,,	,,	,,	4,250	12,500
Jeneral Baquedano	,,	,,	,,	2,335	1,500
Trigonia	,,	,,	British	1,667	1,050
Haliotis	,,	,,	,,	1,659	1,050
Sampo	,,	,,	Foreign	1,339	3,100
Nadeshda	,,	,,	,,	237	400
Asia	,,	,,	,,	1,168	1,050
Ermack	,,	,,	,,	5,106	10,000
Daghestan ..	,,	,,	,,	2,818	1,500
Veria	,,	,,	British	3,270	1,750
North Lyoll ..	,,	,,	,,	2,070	2,500
By S. P. Austin & Son, Ltd., Wear Dockyard, Sunderland.					
† Hornsey	Steel	Steam	British	1,802	1,000
† Elizabeth Holland	,,	,,	,,	1,801	1,029
† Harrington ..	,,	,,	,,	1,730	1,154
† Harport	,,	,,	,,	1,747	1,154
† Harlech	,,	,,	,,	1,199	787
† Hendon	,,	,,	,,	1,750	1,000
By Bartram & Sons, South Dock, Sunderland.					
† Consols	Steel	Steam	British	3,492	1,716
† Palestrina ..	,,	,,	,,	3,489	1,728
† Wagner	,,	,,	,,	3,474	1,752
† Beatrice	,,	,,	,,	3,343	1,590
† Louise	,,	,,	Foreign	3,353	1,800
By Cook, Welton & Gemmell, Hull.					
† 2 Trawlers ..	Iron	Steam	British	65ea	380ea
† 3 ,, ..	,,	,,	,,	62ea	320ea
† 2 ,, ..	,,	,,	,,	53ea	300ea
† Butterfly	,,	,,	,,	68	350
† Rambler	,,	,,	,,	55	320
† City of Hull ..	,,	,,	,,	65	350
† Forward	,,	,,	,,	62	350
† Edward B. Cargill	,,	,,	,,	65	370
† Shakespeare ..	,,	,,	,,	60	350
† Royalist	,,	,,	,,	66	350
† Colonial Empire	,,	,,	,,	53	350
† 2 Trawlers ..	,,	,,	,,	53ea	320ea
† 2 ,, ..	,,	,,	,,	52ea	320ea
† 2 ,, ..	,,	,,	,,	60ea	320ea
† New Zealand ..	St'l & Iron	,,	,,	111	550
† 2 Trawlers ..	Iron	,,	,,	33ea	350ea
† 4 Fleeters.. ..	,,	,,	,,	55ea	220ea
† Roman Empire ..	,,	,,	,,	63	370
† Strephon	,,	,,	,,	52	280
† Fawn	,,	,,	,,	65	350
† Lyairgas (l'gth'n'd)	,,	,,	,,	62	320
† 3 Gas Floats ..	Stee	,,	,,	30ea	
By Wm. Doxford & Sons, Ltd., Pallion, Sunderland.					
† Laureldene ..	Steel	Steam	British	3,521	1,300
† Meridian	,,	,,	,,	3,487	1,300
† Clan Macfarlane..	,,	,,	,,	4,823	2,800
† Guernsey	,,	,,	Foreign	4,444	1,800
† Polymitis	,,	,,	,,	3,430	1,300
† Noranmore ..	,,	,,	,,	5,648	3,000
† Nelson	,,	,,	British	1,841	900
† Forest Castle ..	,,	,,	,,	2,850	1,150
† Beechmore ..	,,	,,	Foreign	3,420	1,500

* Compound. † Triple.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
By Earle's Shipbuilding & Engineering Co., Ltd., Hull.					
† H.M.S. Prometheus	Steel	Steam	British	2,135	7,000
† ,, Bullfinch ..	,,	,,	,,	300	6,000
† ,, Dove ..	,,	,,	,,	300	6,000
† Cleopatra	,,	,,	,,	6,890	5,000
† Golden Hope ..	Iron	,,	,,	166	350
† Brederode ..	,,	,,	Foreign	165	350
† Rosedale	,,	,,	British	169	350
† Silverdale	,,	,,	,,	169	350
† Riversdale ..	,,	,,	,,	169	350
† Starling	Steel	,,	,,	181	450
† Lily	,,	,,	,,	181	450
† Oceanic	,,	,,	,,	220	450
† Pacific	,,	,,	,,	220	450
† Warrior	,,	,,	,,	220	450
† Ullswater	,,	,,	,,	220	450
† Quixotic	,,	,,	,,	197	450
† Romantic	,,	,,	,,	197	450
† Prince George ..	,,	,,	,,	2,040	6,800
† Prince Arthur ..	,,	,,	,,	2,040	6,800
† Syria	,,	,,	,,	781	1,300
† Lowestoft	,,	,,	,,	150	600
† Vulcan	,,	,,	,,	200	450
† Conqueror ..	,,	,,	,,	200	450
† Uriel	,,	,,	,,	200	450
† Stoic	,,	,,	,,	205	400
ALSO MACHINERY FOR					
† Judith	—	,,	Foreign		400
† Julie	—	,,	,,		400
● Rollo	—	,,	British		1,150
By Forrestt & Sons, Ltd., Wyvenhoe, Essex.					
Double Sleigh Boat	Wood	Sail	British	8	—
• Medway	Steel	Steam	,,	70	225
2 Coal Barges ..	,,	—	,,	90ea	—
Pinnace	Wood	Sail	,,	6	—
Dredger Barge ..	Steel	—	,,	70	—
• 6 Cutters	Wood	Steam	,,	5ea	80ea
Whale Boat ..	Steel	Sail	,,	5	—
Niagara	,,	,,	,,	100	—
• 2 Patent Launches	Al'minium	Steam	,,	5ea	6ea
,, Barge ..	,,	—	,,	4	—
2 Barges	Steel	Sail	,,	30ea	—
• Bucket Dredger ..	,,	Steam	,,	35	43
• Yacht's Launch ..	Wood	,,	,,	2	6
2 Sprit Barges ..	Steel	Sail	,,	80ea	—
Ferry Boat ..	,,	—	,,	1	—
• anshee	,,	Steam	,,	55	250
Also 37 Sailing and Rowing Boats.					
By R. & H. Green, Ltd., Blackwall.					
• Sandfly	Steel	Steam	British	66	113
† Conservator ..	,,	,,	,,	222ym	440
4 Lighters ..	,,	—	,,	130ea	-
• Excelsior	,,	Steam	,,	66	115
14 Lighters ..	,,	—	,,	70ea	—
Lighter	,,	—	,,	120	—
By Wm. Harkess & Son, East Slipway, Middlesbro'.					
† Pachtusoff ..	Steel	Steam	Foreign	1,050	450
† Gallia	,,	,,	,,	507	400
† Saxon ..	,,	,,	British	495	400
† No. 144	,,	,,	—	510	400
† No. 145	,,	,,	--	740	480
By John Jones & Sons, Brunswick Dock, Liverpool.					
• Sapphire	Steel	Steam	British	273	450
Nos. 1 to 8 ..	Iron	—	,,	35ea	—
Raposa Cao ..	Steel	--	,,	85	—
No. 21	,,	—	,,	85	—
Touro Camelo ..	,,	—	,,	203	—
No 20	,,	—	,,	203	—
Itha Mexiouna .	,,	Steam	Foreign	120	150
Riversby	Iron	,,	British	160	350
Carrington ..	,,	,,	,,	160	350

• Compound. † Triple. ● Quadruple.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
By W. H. Potter & Sons, Queen's Dock, Liverpool.					
† H.M.S. Bramble ..	Steel	Steam	British	—	1,300
† Skipjack .. .	,,	,,	,,	—	175
By Sir Raylton Dixon & Co., Ltd., Middlesbrough-on-Tees.					
Albertville ..	Steel	Steam	Foreign	3,805	2,400
Elna	,,	,,	,,	1,330	690
Manchester City	,,	,,	British	7,233	3,750
Therese	,,	,,	Foreign	1,331	690
Severn	,,	,,	British	3,760	3,000
Orono	,,	,,	,,	2,891	1,100
Principe	,,	,,	Foreign	192	200
Romney	,,	,,	British	5,750	2,350
No. 457	,,	,,	,,	4,000	3,100
No. 461	,,	,,	,,	3,000	2,000
By G. Rennie & Co., Thames Street, Greenwich.				Tons displacement.	
Margaret	Steel	Steam	—	120	350
Helena	,,	,,	Foreign	120	100
Velox	,,	,,	—	110	300
No. 698	,,	,,	—	75	120
Caisson . ..	,,	—	Foreign	200	—
10 Cargo Barges ..	,,	—	—	260e	—
Nos. 630 and 631 ..	,,	Sail	—	250e	—
7 Lighters ..	,,	—	—	210e	—
Conway & Devon	,,	—	—	180e	—
10 Lighters ..	,,	—	—	170e	—
21 ,, ..	,,	—	—	140e	—
4 ,, ..	,,	—	—	150e	—
By Robt. Thompson & Sons, Sunderland.					
† Farnham	Steel	Steam	British	3,101	1,600
† Ijstroom	,,	,,	Foreign	1,027	1,300
† Ormazan	,,	,,	British	3,237	1,600
† Alala	,,	,,	,,	3,217	1,550
† Replingham ..	,,	,,	,,	2,570	1,350
† Albanian	,,	,,	,,	2,935	2,100
† Lynalder	,,	,,	,,	3,230	1,550
† No. 207	,,	,,	,,	336	370
By Camper & Nicholsons, Ltd., Gosport.					
Rubicon	Wood	Sail	British	68ym	—
Heartsease ..	,,	,,	,,	90ym	—
Avis	Composite	Steam	,,	64ym	—
By Cottingham Bros., Goole.					
Lighter	Wood	—	British	70	—
Wasp	,,	Sail	,,	100	—
Foam	,,	,,	,,	100	—
By Sidney J. Dewdney, Brixham.					
Provider	Wood	Sail	British	50	-
Flora	,,	,,	,,	51	—
Faithful	,,	,,	,,	51	—
By H. Fellows & Son, Yarmouth.					
Stanley	Steel	Barge	British	50	—
Gladys	,,	,,	,,	50	—
Fortis	,,	Sail	,,	66	—
Susie	Wood	,,	,,	41	—
Bessie	,,	,,	,,	80	—
By Strand Slipway Co., Sunderland.					
† Marjorie	Steel	Steam	British	928	—
† Abchurch ..	,,	,,	,,	1,621	—
2 Hopper Barges ..	—		—	ea150	—
By John Blumer & Co., North Dock, Sunderland.					
Stilbe	Steel	Steam	Foreign	3,241	1,950
Joseph Holland ..	,,	,,	British	1,785	1,000
Admiral Nelson ..	,,	,,	,,	3,092	1,700
Philae	,,	,,	,,	2,768	1,550
Whitgift	,,	,,	,,	2,992	1,800
Queenmoor ..	,,	,,	,,	2,119	1,356
Hermes	,,	,,	,,	3,450	2,592
By Blyth Shipbuilding Co., Ltd., Blyth.					
† William Broadley	Steel	Steam	British	3,060	1,250
† Longbenton ..	,,	,,	,,	923	550
† Sigrid	,,	,,	Foreign	2,093	1,045

† Triple.

By Ropner & Son, Stockton-on-Tees.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Chatham	Steel	Steam	British	2,174	800
† Paddington ..	,,	,,	,,	3,903	1,500
† Symra	,,	,,	Foreign	3,006	1,000
† Tenby	,,	,,	British	3,969	1,500
† Bellerby	,,	,,	,,	3,097	1,250
† Euston	,,	,,	,,	2,728	1,000
† Romford	,,	,,	,,	3,035	1,000
† Scarthoe	,,	,,	,,	3,924	1,200
† Brighton	,,	,,	,,	3,463	1,250
† Thirlby	,,	,,	,,	2,009	750
† Alf	,,	,,	Foreign	3,078	1,250
† Astræa	,,	,,	British	3,297	1,250
† Aker	,,	,,	Foreign	2,974	1,250
† Greenwich ..	,,	,,	British	2,990	1,250

By Tyne Iron Shipbuilding Co., Ltd., Willington Quay-on-Tyne.

† Minooo	Steel	Steam	British	796	810
† Guildhall	,,	,,	,,	2,609	1,700
† Haddonhall ..	,,	,,	,,	2,608	1,700
† Clematis	,,	,,	,,	3,640	1,800
† Ella Sayer ..	,,	,,	,,	2,549	1,700
† Sirdar	,,	,,	,,	3,600	1,800

By Edwin Clark & Co., Ltd., Brimscombe, Stroud, Glos.

Gwendolen ..	Steel	Steam	British	2·6	14
* Tigress	,,	,,	,,	6·4	45
† Nuneham ..	,,	,,	,,	36·7	70
* No. 614	,,	,,	Foreign	3·8	20
No. 615	,,	M. Oil	,,	7·13	10
* No. 618	,,	Steam	,,	28·74	140

By Hunt, Fowler & Co., Lime Street, Groves, Hull.

Fern	Steel	Sail	British	160	—
Omega	,,	,,	,,	130	—
Anfield	Iron	Steam	,,	80	10

By Laird Bros., Birkenhead.

* Princess of Wales	Steel	Steam	British	1,009	4,000
† H.M.S. Orwell ..	,,	,,	,,	320	6,000

By Sunderland Shipbuilding Co., Sunderland.

† Leersum	Steel	Steam	Foreign	1,458	950
† Ella	,,	,,	,,	1,437	950
† Yola	,,	,,	British	3,504	1,800
† Wakool	,,	,,	,,	5,014	3,500
† Abergeldie ..	,,	,,	,,	3,778	1,800

By Henry Scarr, Haven Shipyard, Hessle.

* Renown	Ir'n & St'el	Steam	British	220	—
Hilda	,,	Sail	,,	140	—
Freda and Annie	,,	,,	,,	125ea	—
Citizen and Albion	,,	,,	,,	155ea	—
Douro and Nero ..	,,	,,	,,	160ea	—
Windermere ..	,,	,,	,,	155	—
Zittella	,,	,,	,,	130	—

By Cochrane & Cooper, Ltd., Grovehill Shipyard, Beverley.

5 Vessels	Iron	Steam	British	189ea	320ea
La Vague	,,	,,	Foreign	163	270
Kelvin	,,	,,	British	188	420
Pecheries Ostendaises V.		,,	Foreign	159	320
Atlantic	,,	,,	British	177	420
Cassowary ..	,,	,,	,,	203	420
2 Vessels	,,	,,	,,	175ea	270ea
2 ,, ...	,,	,,	,,	148ea	220ea
Viceroy	,,	,,	,,	217	420
2 Vessels	,,	,,	,,	178ea	320ea
2 ,, ...	,,	,,	,,	190ea	320ea
Arctic	,,	,,	,,	187	420
2 Vessels	,,	,,	,,	196ea	450ea
4 ,, ...	,,	,,	,,	172ea	270ea
Aulaby	,,	,,	,,	196	420
Sylvia	,,	,,	,,	205	420
Norseman	Steel	,,	,	177	320
Egret	Iron	,,	,,	210	420

* Compound † Triple.

By Edwards Bros., North Shields.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Catalonia	Iron	Steam	British	172	370
Alaska	,,	,,	,,	135	250
Annie	Steel	,,	,,	151	350
Nile	,,	,,	,,	174	400
St. Vincent ..	,,	,,	,,	172	400
Dolfyn	Iron	,,	Foreign	157	270
Active	,,	,,	British	156	270
Ladas	Steel	,,	,,	172	350
Lysander	,,	,,	,,	173	350
Waago	,,	,,	,,	154	300
Brisk	Iron	,,	,,	156	300
Capricornus ..	Steel	,,	,,	194	350
Frederik Cornelis	Iron	,,	Foreign	153	285
Simon	,,	,,	,,	153	285
Andromeda ..	Steel	,,	British	149	300
Corona	,,	,,	,,	149	380
Cassiopeia.. ..	,,	,,	,,	152	380
Hercules	,,	,,	,,	165	380
Minotaur	,,	,,	,,	126	200
Nervion	Iron	,,	Foreign	173	360
2 Vessels ..	,,	,,	British	136ea	370ea
Vulture	Steel	,,	,,	180	350
Flucie Floss ..	,,	,,	,,	171	350
Glendevon ..	Iron	,,	,,	130	250
Videro	Steel	,,	,,	174	330
Arkansas	Iron	,,	,,	176	350
Thor	Steel	,,	Foreign	200	330
3 Vessels	,,	,,	British	174ea	280ea
No. 609	,,	,,	Foreign	174	290

By Palmer's Shipbuilding & Iron Co., Ltd., Jarrow on Tyne.

† Lord Dufferin ..	Steel	Steam	British	4,843	2,700
† Dragoman ..	,,	,,	,,	3,744	1,600
† Euryalus	,,	,,	Foreign	3,910	2,400
† Bosnia	,,	,,	,,	9,537	4,000
† Khalif	,,	,,	British	3,755	1,600
† Acara	,,	,,	,,	4,543	2,000
† Crewe Hall ..	,,	,,	,,	4,434	2,000
† Monteagle ..	,,	,,	,,	7,058	3,600

By Ritson & Co., Maryport.

† Jaboo	Steel	Steam	British	165	—
* Balmyle	,,	,,	,,	373	450

By Robert Stephenson & Co., Ltd., Hebburn-on-Tyne.

Dock Gates ..	Steel	—	British	—	—
Dock Gates ..	Iron	—	,,	—	—
Pontoon Dock ..	Ir'n& Steel	—	Foreign	12,000	—
Vestal	Steel	Steam	British	576	1,200
Victorious ..	,,	,,	,,	3,434	1,500
Rathfian	,,	,,	,,	448	625
Caisson Gate ..	Iron	—	,,	450	—
Atlas No. 3 (D rr'ck P't'n)	Steel	—	,,	2,517	--
Ranger	Steel	Steam	,,	50	190
Regalia	,,	,,	,,	50	190

By Joseph Scarr, Beverley.

2 Dumb Barges ..	Steel	—	British	250ea	—
Thomas Scarr ..	,,	Sail	,,	130	—
2 Dumb Lighters	Iron	—	,,	200ea	—
† Janet	Steel	Steam	,,	99	250
4 Dumb Lighters	,,	—	,,	255ea	—
† Valiant	,,	Steam	,,	85	200
4 Dumb Barges ..	,,	—	,,	85ea	—
Lighter	,,	—	,,	180	--

By J. Samuel White, East Cowes, Isle of Wight.

* Neuquen	Steel	Steam	Foreign	35	100
* Foam	,,	,,	British	64	150
* Spray	,,	,,	,,	64	150
* Jas. Stevens, No. 1.	,,	,,	,,	25	200
* ,, ,, No. 2.	,,	,,	,,	25	200
* Sapphire	Composite	,,	,,	17	70
* Iris..	Steel	,,	,,	30	70
* Rose	,,	,,	,,	30	70
† Conflict	,,	,,	,,	300	4,800
† Teazer	,,	,,	,,	300	4,800
† Wizard	,,	,,	,,	300	4,800

* Compound. † Triple.

By **Wigham Richardson & Co.**, Neptune Works, Newcastle-on-Tyne.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Umbre	—	Steam	—	1,312	1,250
Hohenfels	—	"	—	5,424	2,500
Juno	—	"	—	3,338	1,550
Sergii Witte	—	"	—	700	800
Taboga	—	"	—	649	650
Ehrenfels	—	"	—	5,435	2,500
Medjerda	—	"	—	1,862	3,500
Malang	—	"	—	3,650	1,550
Silesia	—	"	—	4,950	2,300
Ceres	Engines and boilers only.				1,550
North Lyell					2,500

By **J. T. Eltringham & Co.**, Stone Quay, South Shields.

† Stella	Steel	Steam	Foreign	155	325
† La Goëland	Iron	"	"	170	360
* Naval Prince	Steel	"	British	129	285
* Merchant Prince	"	"	"	130	285
* Gloria	"	"	"	130	285
† Lord Kitchener	"	"	"	160	325
† Roland	"	"	"	160	290
* Doreen	"	"	"	130	285
† Salvo	"	"	"	200	650

By **John Readhead & Sons**, West Docks, South Shields.

Cayo Largo	Steel	Steam	British	3,431	1,750
Frederick Knight	"	"	"	3,599	1,650
Edenmoor	"	"	"	3,284	1,500
Trekieve	"	"	"	3,087	1,500
Pola	"	"	"	3,053	1,650
Peter Jebsen	"	"	Foreign	3,578	1,500
Tantallon	"	"	British	3,076	1,500
Chatton	"	"	"	3,600	1,650

By **J. P. Rennoldson & Sons**, South Shields.

† Hoch van Holland	Steel	Steam	Foreign	176	525
* Furness	"	"	British	224	940
Gilroy	Iron	"	"	150	350
* Hull	Steel	"	"	93	300
Flying Scotsman	Iron	"	"	176	400
* Norseman	"	"	"	51	170
* Goole No. 4	"	"	"	55	170
† Black Swan (engined only)		—	—	—	550

By **C. S. Swan & Hunter, Ltd.**, Wallsend-on-Tyne.

Cardiff Caisson	Steel	—	British	440	—
† America Maru	"	Steam	Foreign	5,870	7,750
Uraga Caisson	"	—	"	240	—
† Polarstjernen	"	Steam	"	3,377	1,500
* Floating Dock	"	—	"	8,850	500
† Olimpo	"	Steam	"	3,378	1,500
† Ultonia	"	"	British	9,844	5,500
† Saint Quentin	"	"	"	4,274	1,900
† Mount Royal	"	"	"	8,784	3,600
† Politician	"	"	"	7,203	4,000
† Osborne	"	"	"	4,302	2,000
† Newcastle	"	"	"	3,450	1,500
† Saint Andrew	"	"	"	8,684	4,500

By **Geo. & Thos. Smith**, Rye, Sussex.

Olive	Wood	Sail	British	31	—
Harry	"	Lght'r	"	—	—
Sidney	"	"	"	—	—
Cosmopolite	"	Sail	"	31	—

By **Furness, Withy & Co., Ltd.**, West Hartlepool.

† Rapidan	Steel	Steam	British	7,359	—
† Chicago	"	"	"	6,408	—
† Taunton	"	"	"	3,793	—
† Mars	"	"	"	3,856	—
† Candleshoe	"	"	"	3,790	—
† Palatinia	"	"	"	3,640	—
† Degama	"	"	"	3,550	—

By **James Harland & Co.**, Tranmere.

Duke	Composite	Sail	British	40	—

• Compound. † Triple.

By **W. Thomas & Sons**, Amlwch Port.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Gaelic	Iron	Sail	British	224	—

By **William Dobson & Co.**, Low Walker, Newcastle-on-Tyne.

New Steamer	Steel	Steam	—	1,108	980
Ceres	"	"	Foreign	3,633	1,550
Florida	"	"	"	5,036	2,250
Ashmore	"	"	British	3,460	1,600
Prah	"	"	"	3,600	1,600

By **Wm. Gray & Co., Ltd.**, West Hartlepool.

Goolistan	Steel	Steam	British	2,746	1,300
Sanna	"	"	Foreign	3,392	1,500
Emanuel	"	"	"	1,649	900
Algorta	"	"	"	2,120	1,200
Povena	"	"	"	2,104	1,200
Cardiff	"	"	British	2,808	1,300
Marselisborg	"	"	Foreign	2,760	1,300
Wilster	"	"	British	2,101	1,200
Azul	"	"	"	3,074	1,500
Marie Suzanne	"	"	"	3,106	1,500
Joseph Merryweather	"	"	"	2,144	1,200
Easingwold	"	"	"	3,107	1,500
Lewisham	"	"	"	2,810	1,300
Ceres	"	"	Foreign	2,010	900
L. H. Carl	"	"	"	1,920	1,100
Mancunia	"	"	British	3,553	2,000
Everest	"	"	"	2,109	1,200
Turkistan	"	"	"	3,204	2,550
Londesborough	"	"	"	3,071	1 500
Britannic	"	"	"	3,043	1,500
Mountby	"	"	"	3,070	1,500
Miles Coverdale	"	"	"	2,842	1,250
Ran	"	"	Foreign	3,070	1,500
Kronborg	"	"	"	3,390	1,700
Barton	"	"	British	3,390	1,700
Daghistan	"	"	"	2,110	1,200
Pendeen	"	"	"	2,120	1,200

By **R. & W. Hawthorn, Leslie & Co., Ltd.**, St. Peter's Works Newcastle-on-Tyne.

Morayshire	—	—	British	7,129	3,200
Wakanui	—	—	"	7,146	3,200
H.M.S. Mermaid	—	—	"	352	6,000
Nellie	Machinery not by builders.	—	"	110	255
T. W. Mould		—	"	110	255
Rhodesia		—	"	110	255
Heathdene		—	"	3,542	1,350
Valentia		—	"	110	255
Floating Workshop		—	"	100	—
Diomed		—	Foreign	98	375
H.M.S. Ocean	Machinery only.	—	British	—	13,500
Cruiser		—	Foreign	—	17,000
"		—	"	—	12,500
Training Ship		—	"	—	1,500
Cruiser		—	"	—	17,000
"		—	"	—	7,500

The machinery of the Mermaid was completed in shop last year, thus the actual machinery output of St. Peter's Works, after deducting this, and also all sets of machinery made by other builders, is 75,400 I.H.P., which is substantially larger than in any previous year.

During the year the company has also carried out a large amount of repair work in their graving dock department connected with the Hebburn Shipyard.

By **Wood, Skinner & Co., Ltd.**, Bill Quay, Newcastle-on-Tyne.

* Mercia	Steel	Steam	British	108	220
* Anglia	"	"	"	108	220
† Lovaine	"	"	"	3,125	1,800
† Helios	"	"	Foreign	710	600
* Clifton	"	"	British	252	325
† Gosforth	"	"	"	1,052	800
† Pearl	"	"	"	677	650
† Stamfordham	"	"	"	920	700
† Muristan	"	"	"	2,790	1,400

• Compound † Triple

By Mackie & Thomson, Govan, Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H. P. I.
† 8 Vessels	Steel	Steam	British	165ea	300ea
† 2 ,, ...	,,	,,	,,	287ea	600ea
† 6 ,, ...	,,	,,	,,	150ea	300ea
† Nestor	,,	,,	,,	176	425
† Jason	,,	,,	,,	176	176
† R. H B. Thomson	,,	,,	,,	194	500
† 2 Vessels	,,	,,	,,	197ea	500ea
† 6 ,, ...	,,	,,	,,	172ea	450ea
† 3 ,, ...	,,	,,	,,	168ea	300ea
† Viking	,,	,,	,,	150	300
† 9 Vessels	,,	,,	,,	169ea	300ea
By John Reid & Co., Ltd., Whiteinch, Glasgow.					
Limari	Steel	Steam	Foreign	2,700	3,000
Fashoda	,,	,,	British	2,800	1,100
Brenda	,,	,,	,,	175	800
Nyassa	,,	,,	,,	2,800	1,100
Forsa	Composite		,,	20	—
Chagres	Steel	,,	Foreign	30	50
4 Lighters.. ..	,,	.	British	400	—
By Alex. Stephen & Sons, Linthouse, Glasgow.					
† Uganda	Steel	Steam	British	5,634	2,300
† Calanthe	,,	,,	,,	429	800
† Umta	,,	,,	,,	5,634	2,300
† Bengalia	,,	,,	Foreign	8,074	4,200
† Induna	,,	,,	British	4,647	2,000
† Fashoda (engines only)		—	,,	—	1,100
By Charles Connell & Co., Whiteinch, Glasgow.					
Maria de Larrinaga	Steel	Steam	British	4,018	—
Pinemore	,,	,,	,,	6,215	—
Kenmore	,,	,,	,,	3,762	—
Maplemore ..	,,	,,	,,	7,717	—
Calista	,,	,,	,,	258	—
Collegian	,,	,,	,,	7,250	—
By Russell & Co., Port-Glasgow.					
Anselmo de Larrinaga	—	Steam	British	4,094	—
Comeric	—	,,	,,	3,979	—
Foreric	—	,,	,,	3,987	—
Den of Ogle ..	—	,,	,,	3,980	—
Herminius ..	—	,,	,,	3,524	—
Horatius	—	,,	,,	3,552	—
Storfond	—	,,	Foreign	3,515	—
Pharsalia	—	,,	British	3,520	—
Falls of Keetie ..	—	,,	,,	3,298	—
Atlantico	—	,,	Foreign	3,346	—
Cunaya	—	,,	British	3,125	—
King Gruffydd ..	—	,,	,,	2,993	—
Inverclyde ..	—	Sail	,,	1,634	—
By D. & W. Henderson & Co., Partick.					
* Norseman.. ..	Steel	Steam	—	521	600
† Angola	,,	,,	—	4,307	2,200
† Dongola	,,	,,	—	4,362	2,200
† Almora	,,	,,	—	4,362	2,200
† Montenegro ..	,,	,,	—	4,408	2,200
† Raphael	,,	,,	—	4,699	3,200
Rainbow	,,	—	—	319	—
Caisson	,,	—	—	320	—
By Scott & Sons, Bowling, Glasgow.					
* Carola	Steel	Steam	British	40	80
† Fluor	,,	,,	,,	884	650
* Nautilus	,,	,,	,,	65	130
* Isabel	,,	,,	,,	233	300
† Corundum ..	,,	,,	,,	1,260	750
By Thomas B. Seath & Co., Rutherglen.					
* Vera	Steel	Steam	Foreign	50	200
* Beaufort	,,	,,	British	120	300
* Rob Roy	,,	,,	Foreign	55	100
Flotilla No. 12 ..	,,	Sail	,,	75	—
,, 13 ..	,,	,,	,,	75	—

* Compound. † Triple.

By D. M. Cumming, Blackhill Dock, Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Mersey	Steel	Steam	British	106	80
Barge	,,	Sail	,,	31	—
Barge	,,	,,	,,	31	—
By Dundee Shipbuilders' Co., Ltd., Dundee.					
† Nellie Bruce ..	Steel	Steam	British	180	320
Conisbro Castle ..	,,	Trwlr.	,,	180	320
Magic	,,	,,	,,	160	300
Honoria	,,	,,	,,	180	320
Hilaria	,,	,,	,,	180	320
* 6 Barge Tugs ..	,,	Steam	,,	55 ea.	220 ea.
† Action	,,	,,	,,	288	300
By Fleming & Ferguson, Ltd., Paisley.					
* Ceratodus.. ..	Steel	Steam	British	500	600
* No. 255	,,	,,	Foreign	300	400
* ,, 271	,,	,,	,,	250	300
* ,, 272	,,	,,	,,	350	400
* ,, 275	,,	,,	,,	600	700
† Pelican	,,	,,	British	250	700
† No. 274	,,	,,	,,	1,500	1,200
* Millgate (set of engines fitted)		—	,,	—	500
† 2 sets of engines ..	—	—	Foreign	—	2,000
By S. M'Knight & Co., Ayr.					
* Florence	Steel	Steam	British	350	510
† Lisette	,,	,,	,,	900	750
† Svend Haug ..	,,	,,	Foreign	683	650
By Archd. McMillan & Son, Ltd., Dockyard, Dumbarton.					
Montclair.. ..	Steel	Steam	British	3,807	—
Saint Kilda ..	,,	,,	,,	3,450	—
Sea Serpent ..	,,	,,	,,	903	—
Canadia	,,	,,	Foreign	4,350	—
By Wm. Denny & Bros., Dumbarton.					
Papanue	—	Steam	British	6,371	Total I.H.P., 30,120.
Waiwera	—	,,	,,	6,100	
Ujina	—	,,	,,	5,310	
Ula..	—	,,	,,	5,310	
Mandalay.. ..	—	,,	,,	3,881	
Mokoia	—	,,	Colonial	3,502	
Mapsurika ..	—	,,	,,	1,202	
Galtee More ..	—	,,	British	1,112	
Bandoola	—	,,	,,	620	
Nagama	—	,,	,,	620	
Yarmouth Belle ..	—	,,	,,	522	
6 Cargo Barges ..	—	—	,,	900	
4 Launches ..	—	Steam	,,	350	
By Lobnitz & Co., Ltd., Renfrew.					
* Drague No. 1 ..	—	Steam	Foreign	541	600
* Abeille XI. ..	—	,,	,,	389	1,200
† Simla	—	,,	British	144	450
* La Burgeoise ..	—	,,	Foreign	820	800
* Vacuna	—	,,	British	44	90
* La Lys	—	,,	Foreign	140	300
† Hakuai Maru ..	—	,,	,,	2,575	2,650
† Harold	—	,,	British	144	450
* Norna	—	,,	,,	30	250
* Clive	—	,,	,,	25	90
* Anholt	—	,,	Foreign	110	300
* Læso	—	,,	,,	110	300
† Calstock	—	,,	British	400	450
Barge No. 1 ..	—	,,	,,	200	—
Barge No. 2 ..	—	,,	,,	200	—
† Kosai Maru ..	—	,,	Foreign	2,575	2,650
* Kerhino	—	,,	,,	140	300
* Rockcutting plants and dredgers, &c.			,,	800	1,700
By R. Napier & Sons, Ltd., Govan Yard, Glasgow.					
Futami Maru ..	—	Steam	—	3,500	4,300
Yawata Maru ..	—	,,	—	3,500	4,300
Camperdown ..	—	,,	—	2,550	1,500
Moravian	—	,,	—	4,660	4,500

* Compound. † Triple.

By James Millar, St. Monance, N.B.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
5 Fishing Boats	Wood	Sail	British	30ea	—
2 Fishing Boats	,,	,,	,,	12ea	—
By Hall, Russell & Co., Ltd., Aberdeen.					
* Caledonian	Steel	Steam	British	143	320
* Cruiser	,,	,,	,,	143	320
* John S. Boyle	,,	,,	,,	143	320
* Mary Bell	,,	,,	,,	143	320
† Bolivar	,,	,,	,,	1,015	850
† Strathearn	,,	,,	,,	160	320
† Stratherrick	,,	,,	,,	160	320
† Mormond	,,	,,	,,	173	320
† Diamante	,,	,,	,,	2,000	1,800
By Hawthorns & Co., Ltd., Leith.					
Yarta	Steel	Steam	British	260	450
J. Baels-Mauricx	,,	,,	Foreign	134	300
Sir Edwin Markham	Composite	,,	British	120	450
Sir Henry Anderson	Steel	,,	,,	120	450
Ulundi	Composite	,,	,,	90	250
Rob Roy	Steel	,,	,,	135	300
Conqueror	,,	,,	,,	135	300
† La Vague (machinery only)			,,	—	350
† Countess of Breadalbane	,,		,,	—	200
By John Scott & Co., Abden Works, Kinghorn.					
† Karrakatta	—	—	—	2,091	1,800
† Kwang Ping	—	—	—	1,966	1,200
† Yacona	—	—	—	550	900
† May	—	—	—	1,415	1,200
By J. McArthur & Co., Paisley.					
Bhagulpur	Steel	Steam	Foreign	153	—
Kildalton	,,	,,	British	152	—
Earnock	,,	,,	,,	152	—
Lady Betty Balfour	,,	,,	,,	55	—
Dunscore	,,	,,	,,	176	—
Dunrowan	,,	,,	,,	176	—
Dunsyre	,,	,,	,,	176	—
Dungoyne	,,	,,	,,	176	—

By Gourlay Bros. & Co., Dundee.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
† Oihonna	Steel	Steam	Foreign	1,025	210
* Eagle	,,	,,	British	647	415
† Coburg	,,	,,	,,	928	122
† Arcturus	,,	,,	Foreign	2,050	530
† Polaris	,,	,,	,,	2,050	530
By Ramage & Ferguson, Ltd., Leith.					
† Louga	Steel	Steam	British	953	99
† Cathay	,,	,,	Foreign	4,111	327
* Natuna	,,	,,	,,	759	88
† Reval	,,	,,	British	1,681	137
† Surf	,,	,,	,,	499	109
† Sifka	,,	,,	,,	1,103	99
† Elba	,,	,,	,,	1,161	136

Machinery completed by Bow, McLachlan & Co., Thistle Works, Paisley.

15 sets tri-compound geared paddle engines; 4 sets tri-compound screw engines; 4 sets compound surface-condensing engines; 1 set compound surface-condensing engines; 1 set compound surface-condensing paddle engines; 10 sets compound surface-condensing screw engines; one compound condensing inverted pumping engine with 2 sets force pumps; also steam steering gears for 14 vessels of the British Admiralty.

Machinery, &c., by John Cran & Co., Leith.

1 set compound surface-condensing engines, 160 I.H.P.; 4 sets launch engines, 100 I.H.P.; 1 set triple engines, 420 I.H.P.; also numerous and extensive overhauls and repairs.

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* Compound. † Triple.

List of vessels engined during 1898 by Denny & Co., Engine Works, Dumbarton.

Name of Vessel.	Description of Machinery.	Trade.
Ujina	Triple single screw	Eastern
Ula	Triple single screw	Eastern
Galtee More	Triple twin screw	Channel
Mapourike	Triple single screw	Colonial
Yarmouth Belle	Triple paddle	River
Mandalay	Triple single screw	Eastern
Mokoia	Triple single screw	Colonial
Ngatfain	Compound twin screw	River
Papanui	Triple single screw	Colonial
Waiwora	Triple single screw	Colonial
Bandoola	Compound twin screw	River
Nagama	Compound twin screw	River
Bruno	Compound twin screw	River
Rollo	Compound twin screw	River
Zero	Compound twin screw	River

Total I.H.P. 30,120

List of vessels engined during 1898 by Dunsmuir & Jackson, Govan, Glasgow.

Name of Vessel.	Builders.
Knight Errant	Chas. Connell & Co.
Maria de Larrinaga	,, ,,
Kenmore	,, ,,
Collegian	,, ,,
Anselma de Larrinaga	Russell & Co.
M. J. Craig	Ailsa Shipbuilding Co.
Nyland	Robt. Duncan & Co., Ld.
Denewell	,, ,,
Limari	John Reid & Co., Ld.
Baron Fairlie	A. Rodger & Co.

Total I.H.P. 21,200.

List of vessels engined during 1898 by Hall-Brown, Buttery & Co., Govan, Glasgow.

Name of Vessel.	Type of Engines.	I.H.P.
Pinto	Triple-expansion	1,000
Craigrowan	,,	1,500
Rutherglen	,,	1,500
Livadin	,,	1,550
Culista	,,	420
Italiana	,,	1,625
Craigneuk	,,	1,530
Brenda	,,	825
Frontier Town	Compound surface-condensing	495
No. 1,697	Triple-expansion	1,500
Lighter	High pressure	100
	Total	12,045

Engines supplied during 1898 by McKie & Baxter, Copland Works, Govan, Glasgow.

They have constructed 21 sets of Marine engines, totalling 4,820 I.H.P.

List of vessels engined during 1898 by David Rowan & Son, Glasgow.

Name of Vessel.	Builders.	I.H.P.
Montclair	A. McMillan & Son, Ld.	1,700
Malaya	Wm. Hamilton & Co.	1,700
Nordhavet	,,	1,600
1 Vessel	Murdoch & Murray	650
Queen Victoria	,,	350
David Fernie	,,	350
Wyefield	Wm. Hamilton & Co.	1,600
Andoni	,,	1,600
Pinemore	Chas. Connell & Co.	3,300
Heathville	Wm. Hamilton & Co.	1,600
Shrewsbury	,,	1,600
Sea Serpent	A. McMillan & Son, Ltd.	1,000

List of vessels engined during 1898 by Blackwood & Gordon
Port-Glasgow.

Name of Vessel.	Builders.	I.H.P.
† Suecia	Blackwood & Gordon ..	800
† Balder	" ..	1,650
* Ierne	" ..	750
† Julius Holmblad ..	Wm. Hamilton & Co. ..	900
† Pharsalia	Russell & Co.	2,000
† Den of Ogle ..	"	2,500

List of vessels engined during 1898 by Muir & Houston, Ltd.,
Kinning Park, Glasgow.

Name of Vessel.	Builders.	I.H.P.
† 5 Vessels... ..	Mackie & Thomson ..	600ea
† Fluor	Scott & Sons	600
† Evona	Ailsa Shipbuilding Co. ..	600
† 20 Vessels ..	Mackie & Thomson ..	300ea
† 6 " ..	" ..	450ea
† R. H. B. Thomson	" ..	500
† Achroite	J. Shearer & Son	700
† Obsidian	A. Rodger & Co.	1,000
† Lars Kruse ..	Carmichael, Maclean & Co.	1,000
* 2 Vessels	Ailsa Shipbuilding Co. ..	800ea
* Balmarino ..	" ..	700
† 2 Vessels	" ..	900ea
† 3 Vessels	Carmichael, Maclean & Co.	900ea
† Katoomba ..	Ailsa Shipbuilding Co. ..	800

Total I.H.P. 22,800

List of vessels engined during 1898 by Rankin & Blackmore,
Eagle Foundry, Greenock.

Name of Vessel.	Builders.	I.H.P.
† Storfond	Russell & Co.	1,800
† Vega	Murdoch & Murray ..	1,100
† Comeric	Russell & Co.	2,050
† Foreric	"	2,050
† 1 Vessel	Robt. Duncan & Co., Ltd.	2,200

Total I.H.P. 9,200.

List of vessels engined during 1898 by Ross & Duncan,
Whitefield Works, Govan, Glasgow.

Name of Vessel.	Type of engines.	I.H.P.
2 Vessels	Comp'nd surface-condensing	650ea
Carola	" "	90
Greville Vernon ..	" "	520
Sarah Brough ..	" "	475
6 Trawlers	Triple-expansion	300ea
Rathfran	Comp'nd surface-condensing	700
Jaboo	Triple-expansion	400
Isabel	Comp'nd surface-condensing	330
Katherine	" "	400
Constantijn ..	" "	200
Volscian	Triple-expansion	700
2 Trawlers	"	425ea
2 Vessels	Comp'nd surface-condensing	750ea
2 "	" "	500ea
Rock Channel ..	" "	650
Gertrude	" "	675
5 Sets	" "	1,360
1 Set	Triple-expansion	300

Total I.H.P. 13,250.

In addition to boilers for above engines, 8 boilers representing 2,480 I.H.P., were constructed for home and abroad.

SPANISH.

By Companie Transatlantic, Cadiz.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Chacon	—	Steam	Spanish	15	50

* Compound. † Triple.

IRISH.

By Harland & Wolff, Ltd., Queen's Island, Belfast.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† New England ..	Steel	Steam	British	11,394	7,800
† Statendam ..	"	"	Foreign	10,320	6,300
† Bay State	"	"	British	6,824	4,200
† German	"	"	"	6,763	2,750
† Manhattan ..	"	"	"	8,004	2,700
a Afric	"	"	"	12,300	4,800
a Medic	"	"	"	12,300	4,800

By Workman, Clark & Co., Ltd., Belfast.

† Indore	Steel	Steam	British	7,300	4,500
† Beacon Grange ..	"	"	"	4,042	2,720
† City of Corinth ..	"	"	"	5,443	3,750
† Rippingham Grange	"	"	"	5,790	3,250
† Workman	"	"	"	6,116	3,600
† Castilian	"	"	"	7,580	5,000
† Quernmore ..	"	"	"	7,303	4,500
† Heathmore ..	"	"	"	3,147	1,200
† Stentor	"	"	"	6,754	4,000

CANADIAN.

By Polson Ironworks, Toronto.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Victoria	—	Steam	Canadn.	200	400
Tyrrel	—	"	"	200	300
Burpee	—	"	"	10	50
Wanda	—	"	"	10	100

By British Columbian Ironworks, Vancouver.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
Caledonia ..	—	Steam	Canadn.	570	17
Strathcona ..	—	"	"	600	17
Iskoot	—	"	"	590	17
Lightning ..	—	"	"	557	42
Rothesay	—	"	"	553	17
Nahleen	—	"	"	590	17
Marquis of Dufferin	—	"	"	630	17

By J. W. Bulger, Vancouver.

Duchesnay ..	—	Steam	Canadn.	277	10
M'Connell ..	—	"	"	727	17
Tyrrell	—	"	"	678	17
Ogilvie	—	"	"	747	18

By J. Todd, Victoria, B.C.

Canadian	—	Steam	Canadn.	716	15
Columbian ..	—	"	"	716	15
Victorian	—	"	"	716	15

FRENCH.

By La Cie Des Messagerries Maritimes, La Ciotat.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Tonkin	Steel	Steam	Foreign	6,400	7,200
† Annam	"	"	"	6,400	7,200

By Les Chantiers de la Seyne.

† Marechal Beodoro	Steel	Steam	Foreign	2,032	3,400
† Chateaurenault ..	"	"	"	5,662	23,000
† Sinai	"	"	"	4,824	3,300
† Chodoc-Paquebot	"	"	"	4,665	2,800
* Olcyon	"	"	"	82	135
* Brague Herault ..	"	"	"	130	75

By E. Lucas & Co., Dieppe.

* Roubaisay ..	Steel	Steam	Foreign	—	110
* Yvonue	"	"	"	—	150
* Cormoran ..	"	"	"	—	300

* Compound. † Triple. " Quadruple.

AMERICAN.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
By Chicago Shipbuilding Co., South Chicago, Ill., U.S.A.					
a William R. Linn..	Steel	Steam	Americn	4,328	2,500
Maia	,,	Sail	,,	3,804	—
Illinois (Fire boat)	,,	Steam	,,	ab 300	600
By Cleveland Shipbuilding Co., Cleveland, O., U.S.A.					
a Superior City ..	Steel	Steam	Americn	4,795	1,600
a Presque Isle ..	,,	,,	,,	4578·71	1,600
† Clarence A. Black	,,	,,	,,	4,521	1,400
† Huron	,,	,,	,,	1,945	950
By Wm. Cramp & Sons' Ship and Engine Building Co., Philadelphia, U.S.A.					
† Alabama	Steel	Steam	Americn	11,500d	12,000
† Kasagi	,,	,,	Foreign	5,000d	17,000
† Havana	,,	,,	Americn	5,000	5,000
† Admiral Dewey ..	,,	,,	,,	2,000	2,500
† Admiral Sampson	,,	,,	,,	2,000	2,500
† Admiral Schley ..	,,	,,	,,	2,000	2,500
† Admiral Farragut	,,	,,	,,	2,000	2,500
By Delaware River Iron Shipbuilding & Engine Works, "Roach's Shipyard," Chester, Pa., U.S.A.					
Jos. J. O'Donohue	Steel	Steam	Americn	850	1,000
† Horatio Hall ..	,,	,,	,,	3,300	4,200
† Malay	,,	,,	,,	150	750
† Sylph	,,	,,	,,	150	750
† Cape Charles ..	,,	,,	,,	1,000	1,400
† Atlas	,,	,,	,,	2,700	1,800
* Philadelphia ..	,,	,,	,,	1,800	2,200
† Hamilton	,,	,,	,,	3,100	4,000
† Jefferson	,,	,,	,,	3,100	4,000
By Fore River Engine Co., Weymouth, Mass., U.S.A.					
* Caprice	Wood	Steam	Americn	10	75
Eleanor	,,	Sail	,,	6	—
Ladoga	,,	Steam	,,	45	250
By Globe Iron Works Co., Cleveland, O., U.S.A.					
† Algonquin .	Steel	Sl & St	Americn	850	2,300
† Quandoga	,,	,,	,,	850	2,300
D. Z. Norton ..	,,	Sail	,,	2,950	—
a H. S. Holden ..	,,	Steam	,,	4,420	1,800
† R. W. Wilmot ..	,,	,,	,,	900	2,800
* Ann Arbor ..	,,	,,	,,	1,900	1,200
By Harlan & Hollingsworth Co., Wilmington, Del., U.S.A.					
† Niagara	Steel	Steam	Americn	1443 87	2,000
† Gellysburg ..	,,	,,	,,	558·27	850
† Tennessee ..	,,	,,	,,	1,240	2,000
* Gem	,,	,,	,,	62	350
† S. T. Morgan ..	,,	,,	,,	1,910	1,200
† Valley Forge ..	,,	,,	,,	558·27	850
By Newport News Shipbuilding and Dry Docks Co., Newport News, U.S.A.					
* Kearsage	Steel	Steam	Americn	11,525	10,000
* Kentucky	,,	,,	,,	11,525	10,000
* Illinois .. .	,,	,,	,,	11,525	10,000
By A. Sewall & Co., Bath, Maine, U.S.A.					
Erskine M. Phelps	Steel	Sail	Americn	2,999	—
By Moran Bros., Seattle.					
15 Vessels.. ..	—	Steam	Americn	600ea.	800ea.
By Detroit Dry Dock Co., Detroit.					
City of Erie ..	—	Steam	Americn	2,430	5,560
America	—	,,	,,	486	1,000
Troy	—	,,	,,	3,655	2,000
By American Steel Barge Co., West Superior.					
Maida	—	Sail	Americn	3,474	—
Alex M'Dougall ..	—	Steam	,,	3,686	2,500
By Bell Ironworks, Buffalo.					
H. D. Goulder ..	—	Steam	Americn	156	800
Primrose	—	,,	,,	50	80

* Compound. † Triple. *a* Quadruple.

GERMAN.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
By Actien Gesellschaft Neptun Schiffswerft & Maschinen-Fabrik, Rostock.					
† Harald	Steel	Steam	German	1,511	600
† Herzog Johann Albrecht ..	,,	,,	,,	1,235	550
† Franz Horn ..	,,	,,	,,	1,511	600
† Henry Horn ..	,,	,,	,,	1,511	600
† Hedwig	,,	,,	,,	2,358	800
† Borkum	,,	,,	,,	1,190	550
† Siegmund.. ..	,,	,,	,,	1,494	600
† Sieglinde	,,	,,	,,	1,494	600
By Bremer Vulkan, Vegesack.					
† Bremen Vulcan ..	Steel	Steam	Foreign	760	450
† Egeria	,,	,,	,,	627	360
† Schwalbe	,,	,,	,,	1,075	850
† Finnland	,,	,,	,,	2.229	850
† Livland	,,	,,	,,	2,335	1,050
By Flensburger Schiffsbau Gesellschaft, Flensburg.					
† Elbing	Steel	Steam	German	5,672	2,800
† Siam	,,	,,	Foreign	3,875	1,600
† Energi	,,	,,	,,	1,103	500
† Algieba	,,	,,	German	1,948	700
† Bielefeld	,,	,,	,,	5,185	2,500
* Elsa	,,	,,	,,	815	400
a Barenfels	,,	,,	,,	5,609	2,550
† Jupiter	,,	,,	,,	2,050	700
† Varzin	,,	,,	,,	5,206	2,500
By Gebruder Sachsenberg Gesellschaft mit Beschrankter, Haftung, Rosslau, Elbe, Anhalt.					
† V.E. & S.S. 23 ..	Steel	Steam	German	573d	600
† V.E. & S.S. 1 ..	,,	,,	,,	600d	800
† Deutsch VII. ..	,,	,,	,,	580	650
† Oesterr VIII ..	,,	,,	,,	580	650
† Dampfschiffahrt IX.	,,	,,	,,	580	650
* Friedrich Karl ..	,,	,,	,,	170	280
Prahm	,,	Sail	,,	300	—
Naphtaport I. ..	,,	,,	,,	500	—
* La Estrella del Oriente	,,	Steam	Foreign	50	40
By Howaldtswerke, Kiel.					
No. 319, 320 ..	Stl. & Wd.	—	Foreign	2,400	144
,, 331, 332 ..	Steel	—	,,	2,350	144
† Imperator Nicolai II.	,,	Steam	,,	923	700
† Tranekjær ..	,,	,,	,,	178	350
Luhe	,,	—	German	191	—
† Lisa	,,	Steam	Foreign	1,597	650
* Howe	,,	,,	German	11	25
† Eiborus	,,	,,	Foreign	926	600
† Aju-Dagh	,,	,,	,,	929	600
* Dredger . ..	,,	,,	German	300	120
† Haidamah ..	,,	,,	Foreign	900	1,800
† Tatumbla.. .	,,	,,	,,	108	180
† Hienstein	,,	,,	German	1,500	550
† Avaner	,,	,,	Foreign	500	1,500
* Hertha	,,	,,	German	73	90
By Janssen & Schmilinsky, Hamburg.					
* Mariscal	Steel	Steam	Foreign	43	100
* Sperber	,,	,,	German	42	180
* Assistent	,,	,,	Foreign	72	250
* Feodora	,,	,,	German	149	350
* Crocus	,,	,,	,,	30	65
* Norderney ..	,,	,,	,,	68	250
* Paula	,,	,,	,,	42	180
By Johannsen & Co., Danzig.					
* Auguste	Steel	Steam	Foreign	68	120
* Oguinsk	,,	,,	,,	68	120
* Vistula	,,	,,	,,	97	150
* Genitiv	,,	,,	German	143	250
By Vulcan & Co., Stettin.					
† Hansa	Steel	Steam	Foreign	5,890	10,000
† Hai Shen	,,	,,	,,	2,950	8,000

* Compound. † Triple. *a* Quadruple.

By Richardson, Duck & Co., South Stockton Iron Shipyard, Thornaby-on-Tees.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Brittany	Steel	Steam	British	2,926	307
Incemore	"	"	"	3,059	308
Inglefield	"	"	"	2,411	245
Dromore	"	"	"	3,063	303
Ethel	"	"	"	2,335	238
Clara	"	"	"	2,430	245
Sir W. T. Lewis	"	"	"	3,517	306
Peerless	"	"	"	3,111	256
Dawlish	"	"	"	3,446	306
Wimborne ..	"	"	"	3,550	281
Gorsemore ..	"	"	"	3,163	303

By Edwards & Co., Millwall.

Mooring Lighter	Composite	—	British	240	—
Dredger	Steel	—	"	55	—
Water Barge ..	"	—	Foreign	12	—
* Tecum	Teak	Steam	"	20	130
* Tug	Steel	"	"	28	100
* Victorious ..	"	"	British	45	120
Dredger	"	—	"	25	—
3 Spoil Barges ..	"	—	"	14ea	—
Crane Barge ..	"	—	"	15	—
Gang Boat ..	"	—	"	25	—
Sussex	"	—	"	120	—
Aqua	"	—	"	30	—
* Arica	"	Steam	Foreign	35	100
* 2 Tugs	"	"	"	30ea	100ea
4 Pontoons ..	"	"	"	8ea	—
* Ucayali	"	"	"	45	130

By J. G. Fay & Co., Ltd., Southampton.

* Alert	Steel	Steam	British	189	420
† Roseneath ..	"	"	"	154	400
8 Vessels	"	Sail	"	100ea	—
Pontoon	"	—	"	900	—
7 Vessels	"	Sail	"	90ea	—

In addition to the above they have undertake some very extensive repairs to all classes of vessels.

By Vickers, Sons & Maxim, Ltd., Naval Construction Works, Barrow-in-Furness.

† Clan MacGregor..	—	Steam	British	—	2,100
† Clan MacKenzie..	—	"	"	—	2,100
Duke of Cornwall	—	"	"	1,540	6,000
Jeanette	—	"	"	217	500
Anglia	—	"	"	6,514	4,200
Amphitrite ..	—	"	"	11,000d	18000
Clan Ferguson ..	—	"	"	4,808	2,800

By A. W. Robertson & Co., Lea Shipbuilding Yard, Canning Town.

67 Lighters ..	Iron	—	—	6,775	—
13 " ..	Steel	—	—	1,260	—

By Sir James Laing & Sons, Ltd., Sunderland.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
Umgeni	Steel	Steam	British	2,662	450
Tuscarora ..	"	"	"	6,117	720
Nippon Maru ..	"	"	Foreign	5,873	1,200
Hong Kong Maru .	"	"	"	5,873	1,200
Umtata	"	"	British	2,655	450
Queen Wilhelmina	"	"	"	3,590	400
Anatolia	"	"	"	3,800	450
Ville de Tamatave	"	"	Foreign	3,710	300

By J. Priestman & Co., Southwick, Sunderland.

† Copenhagen ..	Steel	Steam	British	3,297	312
† Maria	"	"	Foreign	3,648	312
† Kilmaho	"	"	British	2,155	204
† Trold	"	"	Foreign	3,297	312
† Universe	"	"	"	2,541	210
† Folmina	"	"	"	3,712	312

* Compound. † Triple.

By Short Brothers, Sunderland.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. N.
Blanefield ..	Steel	Steam	British	3,411	320
Roker	"	"	"	3,499	300
Lady Joicey ..	"	"	"	3,194	300
Gloriana	"	"	"	2,768	240
Ushaw	"	"	"	2,574	300
Anglo-Chilian ..	"	"	"	3,817	400
Kelvindale ..	"	"	"	3,196	300
Hiso	"	"	"	1,552	140
Athena	"	"	"	3,568	320
Afghanistan ..	"	"	"	3,582	350

By Joseph L. Thompson & Sons, Ltd., North Sands Shipbuilding Yard, Sunderland.

† Reynolds	—	Steam	British	3,264	265
† Bodlewell.. ..	—	"	"	3,420	293
† Masconomo ..	—	"	"	4,183	412
† Ashton	—	"	"	3,196	280
† Dart	—	"	"	3,207	280
† Moorgate	—	"	"	3,201	258
† Valentia	—	"	"	3,242	289
† Zingara	—	"	"	3,463	308
† Salfordia	—	"	"	3,666	330
† Cynthia	—	"	"	3,065	280
† Zuleika	—	"	"	3,777	310
† Stanfield	—	"	"	3,372	300

By T. Turnbull & Sons, Whitehall Dockyard, Whitby.

† Emma	Steel	Steam	British	2,520	236
† Hutton	"	"	"	3,620	281
Advance	"	Sail	"	277	—
Diamond	"	"	"	279	—
* John	"	Steam	"	310	50

List of Vessels engined by Wigham Richardson & Co., Neptune Works, Newcastle-on-Tyne.

Name of Vessel.	I.P.N.
Umbre	1,250
Hohenfels, Ehrenfels and North Lyell	2,500ea
Juno, Malang and Ceres	1,550ea
Sergii Witte	800
Taboga	650
Medjerda	3,500
Silesia	2,300
Total	20,650

In addition to the above they have built boilers for four steamers, as well as large repairs.

List of Vessels built and engined by Yarrow & Co., Ltd., Poplar, E.

One second-class torpedo boat (steel) 60 ft. long by 9 ft 3 in. beam; speed, 20 knots. Foreign Service.

Four first-class torpedo-boats, 152 ft. 6 in. long by 15 ft. 3 in. beam; speed, 24 knots. Foreign Service.

Four torpedo-boat destroyers, 220 ft. long by 20 ft. 6 in. beam; speed 31 knots. Foreign Service.

Four Yarrow's patent water-tube boilers for torpedo boats. British Admiralty.

Six Yarrow's patent water-tube boilers for torpedo boats. Foreign Service.

Two shallow-draft steel steamers, 150 ft. long by 31 ft. beam; draft, 3 ft.; speed, 12 miles. Foreign Service.

One shallow-draft steel steamer, 70 ft. long by 10 ft. beam. Foreign Service.

One shallow draft steel steamer, 55 ft. long by 11 ft. beam; draft, 9 in.; speed, 8 miles. Foreign Service.

One shallow-draft steel steamer, 80 ft. long, by 16 ft. beam; draft 15 in.; speed 10 miles. Foreign Service.

One shallow-draft steel steamer, 60 ft. by 12 ft. beam; draft 12 in.; speed 9 miles. Foreign Service.

* Compound. † Triple.

Central Marine Engine Works, West Hartlepool. Output for the year 1898.

Name of Vessel.	Port of Registry.	I.H.P.
Goolistan	Swansea	1,300
Sauna and Ran	Bergen	1,500ea
Emanuel	Helsingborg	900
Algorta and Povena	Bilbao	1,200ea
Cardiff	Cardiff	1,300
Marselisborg	Copenhagen	1,300
Wilster, Joseph Merryweather and Everest	West Hartlepool	1,200ea
Chicago	Hull	5,500
Azul, Marie Suzanne and Easingwold	London	1,500ea
Ceres	Flensburg	900
L. H. Carl	Copenhagen	1,100
Manounia	Manchester	2,000
Mount Royal	Liverpool	3,600
Turkistan	Swansea	2,550
Londesborough and Britannic	Hull	1,500ea
Mountby	West Hartlepool	1,500
Miles Coverdale	West Hartlepool	1,250
Kronborg	Copenhagen	1,700
Bergenhus	Bergen	1,800
Barton	West Hartlepool	1,700
Daghistan	Swansea	1,200
Pendeen	Falmouth	1,200
	Total	47,300

List of vessels engined by Wm. Allan & Co., Ltd., Scotia Engine Works, Sunderland.

Name of Vessel.	Description of Engines.	H.P. N.	I.H.P.	Pressure.
Edenhall	Triple exp.	250	1,250	160 lbs.
Roker	,,	310	1,550	160 ,,
Copenhagen	,,	315	1,600	160 ,,
Ushaw	,,	300	1,450	160 ,,
Sylviana	,,	335	1,850	200 ,,
Kelvindale	,,	345	1,850	180 ,,
Hiso	,,	160	800	160 ,,
Maria	,,	315	1,600	160 ,,
Lady Joicey	,,	310	1,550	160 ,,
Mayflower	,,	360	1,900	200 ,,
Mars	,,	305	1,550	180 ,,
Trold	,,	315	1,600	160 ,,
		3,620	18,550	

List of vessels engined during 1898 by Sir C. Furness, Westgarth & Co., Ltd., Middlesbro'.

Name of Vessel.	I.H.P.
Manchester City	3,900
Earleswood	1,208
Reresby	1,382
Wladimir Sawin	864
Ultonia	5,600
Ragnar	887
Strakraad Hauzland	392
Clarence	1,000
Yukon	840
2 Vessels	1,600ea
3 ,,	1,500ea
Brookwood	1,200
Royal Exchange	1,268
Sicilia	681
2 Vessels	650ea
Total	29,672
Land engines	2,500
Total	32,172

Vessels engined during 1898 by John Dickinson & Sons, *Ltd., Palmer's Hill* Engine Works, Sunderland.

22 vessels. Total N.H.P. 6,349.

List of some of the engines supplied during 1898 by Plenty & Son, Ltd., Eagle Iron Works, Newbury.

Name of Vessel.	Type of engines.	I.H.P.
Helena	Compo'd surface-condensing	70
1 Vessel	,,	80
1 ,,	,,	100
Tug	,,	100
Cargo Boat	,,	130
Deansgate	,,	360
Sava	Triple-expansion	371
——	,,	400
Malcolm Cann	,,	450
Hopper No. 62	,,	470
,, 63	,,	470

Vessels engined during 1898 by George Clark, Ltd., Sunderland.

25 vessels. N.H.P. 8,387 I.H.P. 51,216.

List of vessels engined during 1898 by W. Doxford & Sons, Ltd., Sunderland.

	I.H.P.
† Laureldene	1,300
† Clan Macfarlane	2,800
† Guernsey	1,800
† Polymitis	1,300
† Noranmore	3,000
† Nelson	900
† Forest Castle	1,150
† Beechmore	1,500
Total	13,750

List of engines and boilers shipped by North Eastern Marine Engineering Co., Ltd., Sunderland.

Name of vessel.	I.H.P.
Amroth Castle, Alaska, Tenby Castle, Manorbier Castle, Pembroke Castle, Waago, and Andromeda	350ea
Bodlewell	1,620
Ladas, Lysander, Capricornus, and Arkansas	400ea
Philae, Alala, and Lynalder	1,550ea
Minotaur and Principe	250ea
Riplingham	1,350
Abchurch	850
Abergeldie	1,800

13 boilers of 5,160 I.H.P. supplied to steamships Regina, Enchantress, Pachtesoff, Catalonia, Alabama, Amazon, and Albertina.

List of vessels engined during 1898 by the Wallsend Slipway & Engineering Co., Ltd., Newcastle-on-Tyne.

Name of vessel.	Builders.	H.P.I.
* Trigonia	Armstrong, Whitworth & Co.	1,050
* Haliotis	,,	1,050
† Sampo	,,	3,100
* Asia	,,	1,050
* Nadejda	,,	400
† Ermack	,,	11,500
Boilers for cruiser	,,	15,750
† Idaho	C. S. Swan & Hunter, Ld.	5,850
† America Maru	,,	7,750
† Saint Quentin	,,	1,900
† Osborne	,,	2,000
† Politician	,,	4,000
* Floating Dock	,,	500
† Minioco	Tyne Iron Shipbuilding Co.	810
† Sirdar	,,	1,800
† Ashmore	W. Dobson & Co.	1,600
† Orient	——	8,000
	Total	68,110

* Compound. † Triple.

List of vessels engined by JOHN STEWART & SON, LTD., Blackwall.

Name of vessel.	Owners.	I.H.P.
* Titus Edrigevitch	Russian Government	600
* Conservator	Thames Conservancy	420

Also 6 new boilers for various steamers.

List of vessels engined by BLAIR & CO., LTD., Stockton-on-Tees.

Name of Vessel.	Builders.	I.H.P
† Croydon	Jos. L. Thompson & Sons	1,650
† 3 Vessels	Richardson, Duck & Co.	1,500ea
† Chatham	Ropner & Son	1,000
† Emma	Turnbull & Son	1,150
† 2 Vessels	Ropner & Son	1,500ea
† 3 "	Richardson, Duck & Co.	1,400ea
† 3 "	Ropner & Son	1,200ea
† 2 "	Richardson, Duck & Co.	1,200ea
† Glencoe	Irvine's Shipbuilding Co.	1,100
† Victorious	R. Stephenson & Co.	1,500
† Admiral Nelson	Jno. Blumer & Co.	1,400
† 2 Vessels	Raylton Dixon & Co.	1,100ea
† Bellerby	Ropner & Son	1,250
† Maxonomo	Jos. L. Thompson & Sons	1,800
† Wm. Broadley	Blyth Shipbuilding Co.	1,400
† Ethel	Richardson, Duck & Co.	1,150
† Romford	Ropner & Son	1,300
† 2 Vessels	"	1,400ea
† Taunton	Furness, Withy & Co.	1,500
† Lewisham	Wm. Gray & Co., Ltd.	1,250
† Peerless	Richardson, Duck & Co.	1,250
† Thirlby	Ropner & Son	800
† Sigrid	Blyth Shipbuilding Co.	1,050
† Zingari	Jos. L. Thompson & Sons	1,500
† Hutton	Turnbull & Son	1,400

Total I.H.P. 46,200.

SCOTCH.

By ALLEY & MACLELLAN, Polmadie, Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Caisson	Steel	—	Foreign	240	—
* Paddle Steamer	"	Steam	British	60	110
Pontoon	"	—	"	15	—
4 Hopper Barges	"	—	"	600	—
"	"	—	"	1,200	—

By CAIRD & CO., LTD., Greenock.

† Isis	Steel	Steam	British	1,728	7,500
† Osiris	"	"	"	1,728	7,500
† Colombian	"	"	"	5,613	3,200
† Antillian	"	"	"	5,608	3,200

By CALEDON SHIPBUILDING & ENGINEERING CO., LTD., Dundee.

† Argo	Steel	Steam	British	1,102	1,250
† Princess Ena	"	"	"	800	800
† Otto	"	"	"	970	1,400
† Truro	"	"	"	970	1,400
* Fagus	"	"	"	940	800
† Sappho	"	"	"	1,450	1,500

By CAMPBELTOWN SHIPBUILDING CO., Campbeltown.

† Castor	Steel	Steam	Foreign	1,250	750
† Pollux	"	"	"	1,252	750
† Febrero	"	"	"	1,876	1,000
† Enero	"	"	"	2,046	1,000

By CHAMBERS BROS., Boatbuilders, Greenock.

* Osprey	Wood	Steam	British	23	65
Phroso	"	Sail	"	6	—

* Compound. † Triple.

By CUMMING & ELLIS, Inverkeithing, N.B.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
* Mars	Steel	—	Foreign	383	170
† Mount Blanc	"	Steam	British	178	500
† Mount Cenis	"	"	"	178	500
* Mount Rosa	"	"	"	184	600
* Mount Viso	"	"	"	184	600
* Simplon	"	"	"	184	600

By ROBT. DUNCAN & CO., LTD., Port-Glasgow.

† Areverga	Steel	Steam	British	62	50
† Constantijn	"	"	Foreign	161	200
† Nyland	"	"	"	1,588	850
† Denewell	"	"	British	1,586	850
† Italiana	"	"	"	2,663	1,000
† ——	"	"	"	4,015	2,200

By GRANGEMOUTH DOCKYARD CO., Grangemouth.

† Pansy	Steel	Steam	British	650	500
† E. M. Dalgas	"	"	Foreign	1,650	1,100
† St. St. Blicher	"	"	"	1,000	750
† Muriel	"	"	British	2,000	1,400
† Virgo	"	"	Foreign	750	700
† Poseidon	"	"	"	750	700
† Engineer	"	"	British	1,050	700

By WM. HAMILTON & CO., Port-Glasgow.

† Malaya	Steel	Steam	Foreign	4,757	2,200
† Nordhavet	"	"	"	3,695	1,600
† Wyefield	"	"	British	3,698	1,600
† Andoni	"	"	"	3,651	1,600
† Heathville	"	"	"	3,693	1,600
† Shrewsbury	"	"	"	3,686	1,600
† Julius Holmblad	"	"	Foreign	1,455	1,100
† Asia	"	"	"	3,690	1,60
† Waddon	"	"	British	3,692	1,600

By IRVINE SHIPBUILDING & ENGINEERING CO., LTD., Irvine.

† 4 Steam Trawlers	Steel	Steam	British	164ea	260ea
* Hector	"	"	"	508	600
† 2 Steam Trawlers	"	"	"	168ea	260ea
* Player	"	"	"	650	700

By JOHN SHEARER & SON, Kelvinhaugh, Glasgow.

† Tourmaline	Steel	Steam	British	835	540
† Achroite	"	"	"	1,196	700

By AILSA SHIPBUILDING CO., Troon, N.B.

* M. J. Craig	Steel	Steam	British	733	820
† Hebrides	"	"	"	585	700
* Sarah Brough	"	"	"	299	491
* The Empress	"	"	"	582	680
* W. M. Barkley	"	"	"	569	680
† Raloo	"	"	"	1,059	820
* Balmarino	"	"	"	461	650
† Clonlee	"	"	"	1,059	800
† Katoomba	"	"	"	500	800

By BARCLAY, CURLE & CO., LTD., Whiteinch, Glasgow.

a Braemar Castle	Steel	Steam	British	6,300	5,200
† Olenda	"	"	"	3,200	2,000
† Oron	"	"	"	3,200	2,000
† Ape	"	"	"	500	520
† Buffalo	"	"	"	300	1,050
† Sobo	"	"	"	3,800	2,500
† Onslow	"	"	"	2,700	1,625
* H.M. Tug Diligent	"	"	"	700	1,350

By FAIRFIELD SHIPBUILDING & ENGINEERING CO., LTD., Govan, Glasgow.

† H.M.S. Argonaut	Steel	Steam	British	11,000	18,000
† H.M.S. Hermes	"	"	"	5,600	10,000
† H.M.S. Highflyer	"	"	"	5,600	10,000
† H.M.S. Leven	"	"	"	308	6,000
† Regele Carol 1	"	"	Foreign	2,400	6,500
† Atmah	"	"	"	1,550	3,500
† Omrah	"	"	British	8,650	8,500
† H.M.S. Pioneer	(Engines	only)			7,000
† Arizona	(Boilers,	Engi	nes, &c.)		4,800

* Compound. Triple. a Quadruple.

By David J. Dunlop & Co., Port-Glasgow.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† T. E. Fuller	Steel	Steam	Foreign	400	1,500
† Haiching	,,	,,	,,	2,100	1,500
By John Fullerton & Co., Paisley.					
* Katherine	Steel	Steam	British	254	400
* Alert	,,	,,	,,	77	100
* May	,,	,,	,,	261	420
* Firth Fisher	,,	,,	,,	492	700
* Frontier Town	,,	,,	,,	294	420
* Harold	,,	,,	,,	301	420
By A. Hall & Co., Footdee, Aberdeen.					
City of Aberdeen	—	Steam	British	194	430
Ben Ledi	—	,,	,,	148	360
Yorkshire	—	,,	,,	192	430
Loch Lomond	—	,,	,,	145	360
Laureate	—	,,	,,	193	430
Atherine	—	,,	,,	145	360
No. 374	—	,,	,,	198	430
By London & Glasgow Engineering & Iron Shipbuilding Co., Ltd., Govan, Glasgow.					
† Needles	Steel	Steam	British	4,697	2,600
H.M.S. Hyacinth	—	,,	,,	5,600	10,000
H.M.S. Dwarf	—	,,	,,	700	1,300
By Murdoch & Murray, Port-Glasgow.					
† Cidade de Porto de Moz		Steam	Foreign	433	800
† Queen Victoria	—	,,	British	274	400
† David Fernie	—	,,	,,	274	400
† Vega	—	,,	Foreign	703	1,090
* Ierne	—	,,	British	494	600
* Cearense	—	,,	Foreign	298	480
† Brunswick	—	,,	British	730	900
* Sobral	—	,,	Foreign	311	480
By T. Orr, Greenock.					
* Britannia	Wood	Steam	British	45	60
Marguerite	,,	Sail	,,	25	—
By Scott & Co., Greenock.					
Chinkiang	Steel	Steam	—	2,004	1,500
Ichang	,,	,,	—	2,004	1,500
Kiukiang	,,	,,	—	2,004	1,500
Kwangse	,,	,,	—	2,004	1,500
Ningpo	,,	,,	—	2,004	1,500
Shansi	,,	,,	—	2,004	1,500
Greta	,,	,,	—	383	500
Idomenous	,,	,,	—	6,700	4,500
Caisson	,,	—	—	200	
H.M.S. Canopus	(Engines only)		—		13,500
By Wm. Simons & Co., Renfrew.					
* William Price	-	Steam	Foreign	1,650	2,250
* No. 15	—	,,	British	1,500	1,400
* Victor Augustinovitch		,,	Foreign	1,000	700
* Goustav Bole	—	,,	,,	1,000	700
* Antleon	—	,,	,,	450	1,100
* No. 354		,,	British	250	450
* Fedor Enrold	--	,,	Foreign	1,000	700
* No. 3	–	,,	British	1,000	1,325
* No. 4	—	,,	,,	1,000	1,325
* Alexander Golovatcheff		,,	Foreign	1,000	700
By Ritchie, Graham & Milne, Whiteinch, Glasgow.					
* Steamer	Steel	Steam	Foreign	75	140
* ,,	,,	,,	,,	85	150
Barge	,,	Sail	,,	30	-
* Steamer	,,	Steam	British	130	250
* ,,	,,	,,	,,	170	280
* Launch	,,	,,	Foreign	50	100
Barge	,,	Sail	,,	60	—
* Launch	,,	Steam	,,	30	55
* Steamer	,,	,,	,,	75	120
* ,,	,,	,,	,,	250	380
* Barge	,,	,,	,,	120	130
3 Barges	,,	Sail	,,	750	—

* Compound. † Triple.

By William Fife & Son, Fairlie, Paisley.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H. P. I.
Lehetetlen	Wood	—	Foreign	11	—
Senta	Composite	—	,,	72	—
Espada and Fuji	Wood	—	British	9ea	—
Viera	Composite	—	,,	37	—
Eileen	Wood	—	,,	16	—
Mignon	,,	—	,,	3	—
Neta	,,	—	,,	12	—
By Forbes & Birnie, Peterhead, N.B.					
Blossom	Wood	Sail	British	20	—
Skylark	,,	,,	,,	18	—
2 Boats	,,	—	—	21ea	—
2 Boats	,,	—	—	22ea	—
Felicity & Chrysolite	,,	,,	,,	12ea	—
Brilliant & Concord	,,	—	—	50ea	—
2 Barges	,,	—	—	10ea	—
2 Boats	,,	,,	—	14ea	—
By A. Munro, Ardrishaig.					
Eala	Wood	Sail	—	8	—
Julia and Daisy	,,	,,	—	—	—
By A. Rodger & Co., Port-Glasgow.					
Craigrowan	—	Steam	British	2,507	—
Greville Vernon	—	,,	,,	169	—
Livadia	—	,,	Foreign	2,497	—
Rutherglen	—	,,	British	2,517	—
Obsidian	—	,,	,,	1,471	—
Baron Fairlie	—	,,	,,	3,598	—
Craigneuk	—	,,	,,	2,514	—
Normanton	—	,,	,,	2,520	—
By Carmichael, Maclean & Co., Greenock.					
† Ajax	Steel	Steam	British	250	600
† Velox	,,	,,	,,	250	600
* Lady Jackson	,,	,,	,,	152	530
* Empress of India	,,	,,	,,	152	530
† Johanna	,,	,,	Foreign	1,250	780
† Lars Kruse	,,	,,	,,	1,495	850
† N. G. Petersen	,,	,,	,,	1,360	800
* Abbotsford	,,	,,	British	250	200
† Ludvig Peyron	,,	,,	Foreign	1,350	850
* Plasma	,,	,,	British	300	350
* Prase	,,	,,	,,	275	350
By Blackwood & Gordon, Port-Glasgow.					
† Succia	Steel	Steam	Foreign	844	800
† Balder	,,	,,	,,	1,365	1,650
* Ierne	,,	,,	British	213	750
By The Clydebank Engineering & Shipbuilding Co., Ltd., Clydebank.					
Kestrel	—	Steam	British	--	–
Ariadne	–	,,	,,		-
Moskva	-	,,	Foreign		
Sheelah		,,	British	–	-
Vera		,,	,,	—	--
Juno		,,	,,	—	--
Fifeshire	-	,,	,,	—	--
Nairnshire	--	,,	,,	—	..
MACHINERY WORK:				-	--
Kostroma	—	,,	---	–	-
Nos. 334 and 335	--		---		--
			Totals ..	34,500	72,300
By A. & J. Inglis, Pointhouse, Glasgow.					
† Magpie	Steel	Steam	British	1,280	3,200
Kenilworth	,,	,,	,,	333	1,800
† Vulture	,,	,,	,,	1,280	3,200
Astrild	Composite	---	,,	68	—
Princess May	Steel	,,	,,	257	700
Prince George	,,	,,	,,	257	700
† Hebrides	—	,,	,,	-	700
MACHINERY SHIPPED	—	—	—	—	500

* Compound † Triple

By J. W. Klawitter, Danzig.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Excellenz Baensrh	Steel	Steam	German	—	300
† E. Kummer	,,	,,	,,	—	300
† Greif	,,	,,	,,	68	200
• Nina Kawkas	,,	,,	,,	180	200
† Saxonia	,,	,,	,,	1,000	550
• Fribbe	,,	,,	,,	—	35
• No. 222 and 223	,,	,,	,,	200	60
• Thorn	,,	,,	,,	150	250
By Oderwerke Actien Gesellschaft, Stettin.					
• Jaromir	Steel	Steam	German	—	180
• Famara	,,	,,	Foreign	1,083	1,000
• Argo	,,	,,	,,	1,083	1,000
• Duel	,,	,,	,,	642	750
• Bagirie	,,	,,	,,	765	550
• Moltke	,,	,,	German	115	240
• Charlotte	,,	,,	,,	21	75
• Richard	,,	,,	,,	26	75
† Oberschlèsien	,,	,,	,,	84	240
† Wilhelm	,,	,,	,,	195	400
• Adler	,,	,,	,,	35	110
• Neptun	,,	,,	,,	73	150
• Barth Packet	,,	,,	,,	112	140
† Trmgard Sub Sole	,,	,,	,,	52	160
† Merkur	,,	,,	,,	233	320
No. 489	,,	P'nt'n	,,	104	—
,, 490	,,	,,	,,	104	—
,, 491	,,	,,	,,	60	—
• Georg	,,	Steam	,,	31	100
By Rickmers & Co., Bremerhaven.					
Mabel Rickmers	Steel	Sail	German	2,065	—
Reichsanzeiger	,,	Barge	,,	675	—
Gegenwart	,,	,,	,,	675	—
Nordsee	,,	,,	,,	675	—
Ostsee	,,	,,	,,	675	—
By Schiffswerft von Henry Koch, Lubeck.					
† Timandra	Steel	Steam	German	1,256	550
• Mouchgut	,,	,,	,,	195	260
• Kanal II.	,,	,,	,,	220	225
• Wasserfahrzeug III.	,,	,,	,,	ab. 280	100
† Herbert Horn	,,	,,	,,	,, 2400	800
Eduard	,,	Sail	,,	430	—
By Schiff und Maschinenbau Actien Gesellschaft "Germania," Kiel.					
† G. 89	Steel	Steam	German	160	2,500
† Tamoyo	,,	,,	Foreign	1,085	6,000
† Gazelle	Steel, &c.	,,	German	2,600	6,000
• Martha	,,	,,	,,	29	60
By J. C. Tecklenborg, A-G., Bremerhaven, Geestemunde.					
a Assyria	Steel	Steam	German	6,575	2,500
† Hans	,,	,,	,,	630	500
† Kurt	,,	,,	,,	630	500
† Harald	,,	,,	,,	185	325
† Arthur	,,	,,	,,	185	325
† Fritz	,,	,,	,,	185	325
† Georg Adolf	,,	,,	,,	185	325
• Dampfschute III.	,,	,,	,,	400	200
Schleppkahn 93	,,	—	,,	565	—
Schleppkahn 94	,,	—	,,	565	—
By F. W. Wencke, Bremerhaven.					
• Fram	Steel	Steam	Foreign	160	250
———	Galv. Stl.	,,	,,	300	—
———	,,	,,	,,	200	—
———	Wood	P'nt'n	German	55	—
———	Galv. Stl.	Steam	Foreign	200	—
• Gluckauf	Steel	Sail	German	170	60
By Actien Gesellschaft "Weser," Bremen.					
• Frangins	Steel	Steam	German	765	650
• Pumpenbagger 121	,,	,,	,,	200	70
• Dampfprahm 122	,,	,,	,,	213	180
,, 123	,,	,,	,,	213	180
Petroleum Leichter	,,	,,	,,	680	—

• Compound. † Triple. a Quadruple.

By Reiherstieg Schiffswerfte und Maschinenfabrik, Hamburg.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
a Balua	Steel	Steam	German	4,779	2,200
† Pelotas	,,	,,	,,	3,943	1,800

DUTCH.

By Maatschappij voor Scheeps-en Werktingbouw Fijenoord, Rotterdam.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Wazenwind	Steel	Steam	Foreign	322d	450
† Gelderland	,,	,,	,,	4,033	10,000
By Royal Shipbuilding and Engineering Co. de Schelde, Flushing.					
a Koning Willem	Steel	Steam	Foreign	4,476	4,000
By Firma A. F. Smulders, Rotterdam.					
* Orletz	—	Steam	Foreign	500	250
* Bucket Dredger		—	,,	700	1,000
11 Hopper Barges	—	Steam	,,	4,950	—
* 7 ,, ,,	—	,,	,,	3,500	250
* Sliedrecht II.	—	,,	,,	300	500
* Ladder Dredger	—	,,	,,	200	200
* Tug Boat	—	,,	,,	150	200
* Floating Elevator	—	,,	,,	150	150
* ,, ,,	—	,,	,,	150	300
* 2 Tug Boats	—	,,	,,	720	400
* 2 Hopper Barges	—	,,	,,	800	250
* Taypus	—	,,	,,	400	250
* Bucket Dredger	—	,,	British	300	250
By Maatschappij De Maas, Rotterdam.					
† Resnorquenr Ostendi	Steel	Steam	Foreign	250	1,000
† Aurora	,,	,,	,,	798	550

BELGIAN.

By Societe Anonyme John Cockerill, Hoboken.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
M. Fuma, N. Tanga	Steel	Steam	Foreign	—	115
Vanckerchoven	,,	,,	,,	—	60
No. 362	,,	,,	,,	—	52
Hainaut	,,	,,	,,	—	220
Ville de Paris (Repairs)	,,	,,	,,	—	—
No. 324	,,	,,	,,	—	115
No. 325	,,	,,	,,	—	52
Koningen Wilhelmina	,,	,,	,,	—	115
No. 328	,,	,,	,,	—	60–65
No. 329	,,	,,	,,	—	—
2 Pontoons	—	—	—	—	—
,,	—	—	—	—	—
Stage for Lifting	—	—	—	—	—
Barge	Steel	—	Foreign	—	—
CCXI.	,,	Sail	,,	—	—

Also a lot of steel and aluminium canoes, steel cutters, and whaleboats for the Congo.

RUSSIAN.

By Bellino Fenderich & Co., Odessa, S. Russia.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Ostarozhnie	Steel	Steam	Russian	210d.	200
Burun	,,	,,	—	75d.	160
Sokol	,,	,,	—	18d.	50
Golubka	,,	,,	—	14d.	30

• Compound. † Triple. a Quadruple.

ITALIAN.

By Geo. Ansaldo & Co., Sestri, Ponente.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Montenegro	Steel	Steam	Italian	2,548	1,600
† Bosnia	"	"	"	2,548	1,600
† Bulgaria	"	"	"	2,548	1,600
† Romania	"	"	"	2,548	1,600
† Condore	"	"	"	144	2,400
† Serbia	"	"	"	2,548	1,600

By Cantiere Poli, Chioggia, Venice.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
Dredger	Steel	Steam	Italian	—	100
Barge	"	—	"	30	—

By Orlando Bros., Leghorn.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Barletta	Steel	Steam	Italian	1,047	900
† Gallipoli	"	"	"	1,100	900
† Caranto	"	"	"	1,200	900

NORWEGIAN.

By Akers Mekaniske, Vœrksted, Christiania.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Skrim	Steel	Steam	Foreign	760	700
† Cabot	"	"	"	97	230
† Norddeble	"	"	"	97	230
† Olga	"	"	"	126	300
† Gro	"	"	"	760	500
* Braken	"	"	"	53	75
† Kolbjon	"	"	"	60	150

By Bergens Mekaniske Vœrksted A.B., Bergen.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Gerda	Steel	Steam	Foreign	979	550
† Fantoft	"	"	"	1,041	550
† Odin	"	"	"	1,045	550

By Fredrikstad Mek. Vœrksted, Fredriksstad.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
Tag	Steel	Steam	Foreign	530	450
Tripts	"	"	"	35	60
—	"	"	"	38	80

By Laaxwaags Shipbuilding & Engineering Co., Bergen.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Rask	Steel	Steam	Foreign	1,011	580
† Veritas	"	"	"	1,133	630

By Nylands Vœrksted, Christiania.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Nervion	Steel	Steam	Foreign	1,147	650
† Bonheur	"	"	"	1,147	650
† Setubal	"	"	"	1,220	650

By Stavanger, Stoberi & Dok, Stavanger.

Name of Vessel.	Built of	Class.	Owners.	G.T. Regis.	H.P. I.
† Snifond	Steel	Steam	Foreign	369	250
* No. 34	"	"	"	90	140

AUSTRIAN.

By Marco W. Martinolich, Lussinpiccolo.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
* Sebenico	Steel	Steam	Austrian	297	340
* Valdarche	"	"	"	35	60

By Stabilimento Tecnico, Triéste.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† 7 Tugboats	Steel	Steam	Austrian	28ea	60
† Bilinski	"	"	"	185	350
† S. Ginsto	"	"	"	165	350
† Wohroschdenie	"	"	Foreign	870	800
† Wpered	"	"	"	870	800
† Kaiser Karl VI.	"	"	Austrian	6,300	12,500
† S. Theodor	"	"	Foreign	1,756	700

* Compound. † Triple.

SWEDISH.

By Kockums Mekaniska Werkstads, Aktiebolag, Malmo.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Jacob Bagge	Steel	Steam	Swedish	750	4,000
Barge	"	—	"	60	—
* Flintrannan	"	Steam	"	125	375

DANISH.

By Burmeister & Wain, Copenhagen.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Nora	Steel	Steam	Danish	858	550
* Horby	"	"	"	12	20
Rudolph	"	Sail	"	209	—
† Freja	"	Steam	"	883	1,500
† Flandria	"	"	"	1,150	550
† Caledonia	"	"	"	1,815	800
4 Barges	"	Sail	"	142ea	—
† Ulabrand	"	Steam	Foreign	1,900	850

By Elsinore Iron Shipbuilding & Engineering Co., Elsinore

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
† Danmark	Steel	Steam	Danish	361·67	800
* Kronprins Frederik	"	"	"	413·56	500
† Nordsoen	"	"	"	117·89	200
† Flandria	"	"	Foreign	1192·84	700
† Arno	"	"	Danish	1384	800
† Tiber	"	"	"	1384	800

PORTUGUESE.

By Emprezza Industrial Portugueza, Lisbon.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H. P. I.
Capitania	—	Steam	Portugs.	102	110

CHINESE.

By Hong Kong & Whampoa Dock Co.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Kee Cheong	—	Steam	Chinese	29	60
Empress	—	"	"	7	15
Tommy Atkins	—	"	"	53	110
Sangkat	—	"	"	16	40
Coronation	—	"	"	285	500
Way Fong	—	"	"	42	110
Claude	—	—	—	24	40
America	—	Steam	—	16	—
Morning Star	—	"	—	95	185
Peng-Fei	—	Sail	—	60	—
Spray	—	"	—	17	—
4 Vessels	—	"	Foreign	40	—
16 "	—	"	Chinese	160	—
2 "	—	—	"	210 ea.	—
4 "	—	Steam	"	12	10

By Boyd & Co., Shanghai.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Vulcan	—	Steam	Chinese	22	60
John Prentice	—	—	"	85	—
2 Vessels	—	Steam	"	56 ea.	150 ea.
2 "	—	—	"	321 ea.	—

JAPANESE.

By Mitsubisku Zosenjo, Nagasaki.

Name of Vessel.	Built of	Class.	Owners.	G. T. Regis.	H.P. I.
Tsukishmia Maru	Aux Steel	Steam	Japanese	1,519	305
Hitachi Maru	"	"	"	6,172	3,888
Fategami	"	"	"	2,737	1,550

* Compound. † Triple.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from October 26th to November 25th, 1898 :—

Oliver, A., assistant engineer, has been promoted to the rank of engineer in H.M.'s Fleet.

Onyon, Wm., engineer to the *Urgent*, for Jamaica Dockyard, to date October 26th.

Ottaway, Edward J., artificer engineer to the *Pembroke* (supernumerary), to date November 1st.

Page, Frederick J., chief engineer to the *Wildfire*, for the *Snapper*, to date November 3rd.

Paul, Oliver R., engineer to the *Niobe*, undated.

Pearson, John C., assistant engineer to the *Buzzard*, to date November 29th.

Picton, Arthur L. (probationary), assistant engineer to the *Trafalgar*, to date October 29th.

Pitt, John, fleet engineer to the *Victoria and Albert*, to date November 18th.

Plant, William J. C., artificer engineer to the *Pembroke* (supernumerary), to date November 1st.

Pollard, Percy (probationary), assistant engineer to the *Philomel*, for disposal, to date October 1st.

Reid, W. S., assistant engineer to the *Centurion*, to date October 27th.

Rider, Robert T., artificer engineer to the *Victory* (supernumerary), to date November 1st.

Roach, R. B., has been appointed assistant engineer.

Roseveare, Wm. H., assistant engineer to the *Galatea*, to date October 29th.

Russell, Charles E., assistant engineer to the *Niobe*, undated.

Russell, Chas. D., engineer to the *Wildfire*, for the *Porcupine*.

Sanders, Jno. S., assistant engineer to the *Thunderer*, to date November 8th.

Sands, Jas., assistant engineer to the *Benbow*, to date Oct. 29th.

Saunders, E. H., fleet engineer to the *Niobe*, undated.

Self, Lionel, artificer engineer to the *Pembroke* (supernumerary), to date November 1st.

Shaw, Jas. F. (probationary), assistant engineer to the *Devastation*, to date November 8th.

Short, E. A., chief engineer to the *Vivid*, for the *Sharpshooter*, to date November 7th.

Smith, A. G., fleet engineer, has been placed on the retired list of his rank, in accordance with the provisions of her Majesty's Orders in Council of February 22nd, 1870; April 30th, 1877; and February 26th, 1897.

Smith, J. A., inspector of machinery to the *President*, additional, for service at the Admiralty, to date September 10th.

Sparkes, E. F., chief engineer to the *Philomel*, to date Oct. 1st.

Thomson, D. A., has been appointed assistant engineer.

Toop, Harry, chief engineer to the *Vivid*, for the *Panther*, to date Novmber 3rd.

Tricker, E., fleet engineer, has been placed on the retired list, with permission to assume the rank of inspector of machinery, in accordance with the provisions of her Majesty's Orders in Council of February 22nd, 1870; April 30th, 1877; and Febrnary 26th, 1897.

Wallace, J., assistant engineer, to be engineer R.N.R.

Walton, Charles E., artificer engineer to the *Vivid* (supernumerary), to date November 1st.

Wells, Thos. J. artificer engineer to the *Melampus*, for the *Gossamer*, to date October 1st.

Whapham, R. H., naval instructor to the *Ramillies*, to date November 15th.

Wheatley, George E., chief engineer to the *Victory*, for the *Star*, to date November 3rd.

Whebby, T., staff engineer, has been advanced to the rank of fleet engineer in H.M.'s Fleet, to date November 1st.

Williams, Thomas, artificer engineer to the *Victory* (supernumerary), to date November 1st.

Wingfield, H. E., fleet engineer to the *Vivid*, for the Reserve, to date November 8th.

The following appointments have been made at the Admiralty from November 26th, to December 22nd, 1898 :—

Adams, John H., fleet engineer to the *Vivid*, for training engineer students, to date December 1st.

Andrew, G. E., assistant engineer, has been promoted to the rank of engineer in her Majesty's Fleet.

Bannett, J. M. C., fleet engineer to the *Thunderer*, for new Royal Yacht, to date December 20th.

Barnes, Benjamin J., fleet engineer to the *Resolution*, to date December 15th.

Begg, William (probationary) assistant engineer to the *Colossus*, to date December 16th.

Bennett, David J., staff engineer to the *Victory*, for the *Glory*, to date December 1st.

Bevan, W. J., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's Fleet.

Camp, John B. A., naval instructor to the *Cæsar*, to date December 17th.

Chumley, T., assistant engineer R.N.R., to be engineer.

Cook, A. E, assistant engineer to the *Victory*, for the *Andromeda*, to date December 16th.

Coleman, W., fleet engineer to the *Victory*, for the *Vengeance*, to date December 17th.

Dart, F. K., chief engineer to the *Pembroke*, for the *Blenheim*, to date December 17th.

Durston, George H., assistant engineer to the *Pembroke*, for the *Grasshopper*, to date December 15th.

Fielder, John, fleet engineer to the *Pembroke*, for Torpedo Depot, to date November 26th.

Fisher, Frederick C. (probationary), assistant engineer to the *Magnificent*, to date December 15th.

Gilbert, James H., fleet engineer to the *Howe*, for Haulbowline Dockyard, to date November 29th.

Grant, William H., fleet engineer to the *Vivid*, for the *Temeraire*, to date December 1st.

Green, R. W., chief engineer to the *President*, for service at the works of Messrs. Whitehead & Co., to date December 17th.

Haddy, Thomas J., fleet engineer to the *Pembroke*, for the *Blenheim*, to date November 26th.

Haddy, T. J., fleet engineer to the *Magnificent*, to date December 17th.

Hardwick, W. W., engineer, has been promoted to the rank of chief engineer in Her Majesty's Fleet.

Hills, A., engineer, has been promoted to the rank of chief engineer in Her Majesty's Fleet.

Lane, C., fleet engineer to the *Majestic*, to date December 17th.

Moore, Charles A., chief engineer to the *Pembroke*, for the *Astraea*, undated.

Moore, G., assistant engineer to the *Alexandra*, to date December 16th.

Nicholson, J. D., fleet engineer to the *President*, for service at Woolwich Arsenal, to date December 17th.

Norrington, Edward, fleet engineer to the *Victory*, for *Reserve*, to date December 15th.

Onyon, W., engineer, has been promoted to the rank of chief engineer in Her Majesty's Fleet.

Pamphlett, William F., staff engineer to the *Pembroke*, for the *Astraea*, undated.

Pippett, W. K., engineer, has been placed on the Retired List.

Ramsey, C., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's Fleet.

Ramsey, George, staff engineer to the *Vivid*, for the *Spartan*, to date December 1st.

Raper, R. St. J., chief engineer to the *Victory*, for the *Scout*, to date December 20th.

Reynolds, T. R., engineer, has been promoted to the rank of chief engineer in Her Majesty's Fleet.

Reynolds, Thomas R., chief engineer to the *Victory*, for the *Barham*, te date November 18th.

Sargent, James J. (probationary), assistant engineer to the *Prince George*, to date December 15th.

Screech, Jonathan J. (probationary), assistant engineer to the *Proserpine*, to date November 30th.

Sutton, Arthur W., engineer to the *Cordelia*, undated.

Thorne, T., staff engineer, has been advanced to the rank of fleet engineer in Her Majesty's Fleet.

Walker, John W. (probationary), assistant engineer to the *Prince George*, to date December 15th.

Wheeler, R. J., fleet engineer, has been placed on the Retired List, with permission to assume the rank of Inspector of Machinery.

White, George H. (probationary), assistant engineer to the *Magnificent*, to date December 5th.

Wiggins, W. T., chief engineer to the *Furious*, to date November 1st.

Wiggins, W. T., chief engineer, has been advanced to the rank of staff engineer in Her Majesty's Fleet.

Williams, George, naval instructor to the *President*, additional for R.N. College, to date January 1st.

Willoughby, J. T., engineer, has been promoted to the rank of chief engineer in Her Majesty's Fleet.

Willoughby, James T., chief engineer to the *Wildfire*, for the *Salmon*, to date November 25th.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

THE year 1898, now numbered with the past, has proved to be, as was some time ago made evident, a record one in the annals of Clyde shipbuilding. Neglecting a few minor firms whose output consists entirely of barges, small launches, sailing boats, and canal scows or small craft which by no stretch of courtesy can be dignified by the term "shipping," 40 firms on the Clyde and its estuary have launched, or sent abroad in pieces, 466,830 tons of new shipping. This is 126,800 tons in advance on the output of last year, 55,990 tons greater than that for the year previous, and 47,166 tons higher than the previous record output of 419,660 in 1883. Messrs. Russell & Co., Port-Glasgow, again head the list of Clyde builders with 44,550 tons, which is 1,639 more than their figure last year, but far below their output of 1890, when with 70 570 tons they headed the list of shipbuilding firms in Great Britain. Second place on the Clyde list on the present occasion is taken by Messrs. W. Denny & Bros., whose output is represented by 15 vessels of 34,900 tons and six barges of 900 tons, total 35,800 tons. Closely following Messrs. Denny, as will readily be noted from subjoined table, is the Fairfield Co., with 35,108 tons, made up of seven steamers; the Clydebank Co. with 34,500 tons, representing eight steamers; and Messrs. Hamilton & Co., with 32,017 tons, made up by nine steamers. All these firms—especially the latter—have improved upon their previous returns immensely, and this is true of almost every individual firm, as will be gathered precisely from an inspection of the table:—

Firm.	Sail.		Steam.		1898. Total Tons.	1897. Total Tons.
	Ves.	Tons.	Ves.	Tons.		
Russell & Co.	1	1634	12	42,917	44,551	42,912
Denny & Bros.... ...	6	900	15	34 900	35,800	25,120
Fairfield Co.	—	—	7	35,108	35,108	10,966
Clydebank Co.... ...	—	—	8	34,500	34.500	23,120
W. Hamilton & Co. ...	—	—	9	32,017	32,017	5,600
Connell & Co.	—	—	6	29,281	29,281	27,483
Stephen & Sons ...	—	—	5	24,418	24,418	21,379
D. & W. Henderson&Co.	2	639	6	22,659	23,298	22,387
Barclay, Curle & Co. ...	—	—	8	20,700	20,700	5,310
Scott & Co.	1	200	8	19,107	19,307	5,450
A. Rodger & Co. ...	—	—	8	17,798	17,798	15,536
Caird & Co.	—	—	4	14,677	14,677	15,824
R. Napier & Sons ...	—	—	4	14,150	14,150	13,660
A. M'Millan & Son ...	—	—	4	12,510	12,510	10,826
London & Glasgow Co.	—	—	3	10,9 7	10,997	7,864
R. Duncan & Co. ...	—	—	6	10,095	10,095	4,991
Simons & Co.	—	—	10	9,350	9,850	7,370
Lobnitz & Co.	2	400	15	8,987	9,387	2,822
Reid & Co.	5	400	6	8,512	8,942	401
Carmichael, M'Lean & Co.	—	—	11	7,084	7,084	5.000
Mackie & Thomson ...	—	—	40	6,941	6,941	6,077
Campbeltown Co. ...	—	—	4	6,424	6,424	4,596
Ailsa Co.	—	—	8	5,347	5,347	4,593
Fleming & Ferguson ...	—	—	7	3,750	3,750	5,250
Murdoch & Murray ...	—	—	8	3,517	3,517	2,558
A. & J. Inglis	1	60	5	3,415	3,475	2,420
D. J. Dunlop	—	—	2	2,500	2,500	1,050
Scott & Sons	—	—	5	2,482	2 482	2,269
Blackwood & Gordon ...	—	—	3	2,422	2,422	1,278
Irvine Co.	—	—	8	2,158	2,150	—
Alley & M'Lellan ...	10	2055	1	60	2,115	7,116
Shearer & Son	—	—	2	2,031	2,031	1,576
Ritchie, Graham & Milne	5	840	9	985	1,825	2,851
S. M'Knight & Co. ...	—	—	3	1,933	1,933	823
J. Fullerton & Co. ...	—	—	6	1,685	1,685	1,821
Chalmers & M'Kivet ...	6	1236	5	201	1,437	725
J. M'Arthur & Co. ...	—	—	8	1,216	1,216	1,556
T. B. Seath	2	150	3	225	375	605
W. Fife & Son	—	169	—	—	169	179
D. M. Cumming .	2	62	1	106	168	691
J. & J. Hay	—	—	—	100	100	220
Minor firms	—	—	—	300	300	17,762
	44	8745	284	458,087	466,832	340,037

To enable a comparison to be made over a period the following Clyde tables since 1860 are given:—

	Tons.		Tons.		Tons.
1898 ...	466,832	1885 ...	193,458	1872 ...	230,347
1897 ...	340,037	1884 ...	296,854	1871 ...	196,229
1896 ...	410,841	1883 ...	419,664	1870 ...	180,401
1895 ...	360,152	1882 ...	391,934	1869 ...	192,310
1894 ...	340,885	1881 ...	341,022	1868 ...	169,671
1893 ...	280,160	1880 ...	241,114	1867 ...	108,024
1892 ...	336,414	1879 ...	174,750	1866 ...	124,513
1891 ...	326,475	1878 ...	222,363	1865 ...	153,932
1890 ...	349,995	1877 ...	169,710	1864 ...	178,595
1889 ...	335,201	1876 ...	174,824	1863 ...	123,252
1888 ...	280,037	1875 ...	211,824	1862 ...	69,967
1887 ...	185,362	1874 ...	262,430	1861 ...	66,801
1886 ...	172,440	1873 ...	232,926	1860 ...	47,833

In the lower reaches of the river, embracing the Port-Glasgow and Greenock districts, the tonnage output exceeds the record of any previous year. The ten firms included in the districts turned out during the year 72 vessels of 154,159 tons and 81,265 I.H.P., compared with last year, when 100,325 tons of shipping of 51,840 I.H.P. were launched—this shows an increase of 53,834 tons, and 29,425 I.H.P. Of the 72 vessels only one was a sailing ship, *Inverclyde*, built by Messrs. Russell & Co., the others being all steamers. With the exception of Messrs. Caird & Co., whose output, however, only shows a slight falling off from last year, all the firms have an increase, two of them being very marked. Messrs. William Hamilton & Co. have increased their output by 26,417 tons; Scott & Co. by 13,857; Duncan & Co. by 5,104 tons; and Carmichael, Maclean & Co. by 2,084 tons

Analysing the Clyde returns to some extent we find that the warship tonnage produced slightly exceeded 45,000 tons, which is a surprisingly small proportion of the total as compared with some previous years. All, or nearly all, the work was for the British Government, and embraced the first-class cruisers *Argonaut*, built by Fairfield, and the *Ariadne*, by Clydebank, both of 11,000 tons displacement; the second-class cruisers *Hermes* and *Highflyer* by Fairfield, and the *Hyacinth* by the London and Glasgow Co., each of 5,600 tons. The year only saw the production of two torpedo-boat destroyers, one from Fairfield and the other from Clydebank.

It will thus be seen that as much as 422,000 tons represented tonnage which in one way or another goes to swell the world's merchant fleet—although, as usual, a goodly proportion of this figure is made up of launches and other small craft which cannot except by courtesy be considered "shipping" in the true sense of the term. Included in the figure, too, were a good number of steam yachts of some size, notable among which was the steam yacht *Atmah*, of 1,550 tons, produced by the Fairfield Co. for Baron Rothschild.

Dredgers and hopper barges have as usual been produced in considerable numbers by several Clyde firms well known for this specialised class of shipping. There is every likelihood that the demand for such craft will grow rather than diminish; the growth in the size of both cargo carrying and mail steamships pressing home to dock and harbour authorises more and more the need for expansion and improvement in harbour accommodation.

Light-draught steamers, barges and other craft shipped abroad in pieces, for river and inland navigation mostly, have again formed no inconsiderable part of the Clyde output, and this we consider is an encouraging sign, indicating as it does the commercial pioneering and expansion which is going on in remote, and it may be hitherto unopened, parts of the globe.

Although to a considerable extent the steam trawlers and line fishing fleets are evolved and augmented by building firms near the base of the steam fishing industry—viz., at the Humber's mouth—the Clyde has nevertheless a giant's share in the production of this special class of shipping. Messrs. Mackie & Thomson, Govan, who have for years past had their stocks constantly occupied—three vessels as a rule being built on the one slip and launched on the same day—have turned out 40 such vessels during the year, and have at present no fewer than 32 on hand and to begin to. Almost all such craft built and building are for owners in Grimsby, or about the mouth of the Humber. Messrs. Mackie & Thomson, seeking an outlet for their surplus orders, some little time ago interested themselves in the establishment of the Irvine Shipbuilding Co. at Irvine, on the Ayrshire coast, and at this yard already about a dozen trawlers have been completed or are on order. Though in less wholesale fashion, trawlers have also been produced by several other Clyde firms. The machinery for the bulk of the trawlers built on the Clyde has been supplied by Messrs. Muir & Houston, and other firms whose work will afterwards be referred to.

But of course the greatest and most notable contributory items to the Clyde's output were high class mail and passenger steamships and huge carriers of mercandise. Of both classes—and irrespective altogether of war vessels—as many as 30 steamers were launched, having a tonnage of 4,000 tons and upwards, while 15 of these were over 5,000 tons. The largest and most elaborately fitted internally was the Orient liner *Omrah*, of 8,600 tons, turned out from Fairfield, while next in point of size and perhaps in equipment, was the *Bengalia*, of 8,074 tons, built by Messrs. A. Stephens & Sons, for the Hamburg-American Co. Other huge steamships were the *Moskva*, a twin-screw vessel built by Clydebank for the Russian Volunteer Fleet; the *Braemar Castle* of 6,300 tons by Messrs. Barclay, Curle & Co., for the Castle Packet Co.'s fleet; the *Pinemore* of 6,215 tons, the *Maplemore* of 7,779 tons, and the *Collegian* of 7,250 tons, all by Messrs. C. Connell & Co., for Liverpool owners; the *Papanui* and the *Wai-wei*, each of 6,300 tons built by Messrs. Denny & Bros., for the Shaw Savill & Albion Co., and the *Columbian* and *Antillia* of 5,600 tons each by Messrs. Caird & Co., for Liverpool owners.

That the Clyde can still lay claim to being provider of a goodly share of the world's new shipping is borne out by the fact that as much as 95,000 tons, or one-fifth of the whole aggregate tonnage, was to foreign account, not of course including the tonnage for our colonies, or India, China, Australia, &c. The countries chiefly patronising the Clyde were Denmark, Sweden, Russia and Japan. Two of the largest steamers produced, the *Moskva* and the *Bengalia*, were to Russian and German account. Three steamers each of between 4,000 and 4,700 tons were for Swedish owners, while all the vessels produced by the Campbeltown Shipbuilding Co.,—four steamers of 6,420 tons—were also for Sweden.

From the nature of the shipbuilding returns—including as they do only one sailing vessel properly speaking of 1,634 tons, and barges, &c., to the extent of 8,745 tons—the marine engineering returns show also an immense advance over previous years. In all, the Clyde marine engineering firms, numbering about 35, have turned out during 1898 no fewer than 382 sets of marine engines, aggregating a total I.H.P. of 510,815, as compared with 283 sets, and 373,195 I.H.P. for 1897. When it is remembered that the unfortunate engineers' strike was only settled in February of this year, the considerably increased output shows that both masters and men have been determined to make up for lost time. The result at least is highly satisfactory, and there is greater satisfaction in the fact that all of the firms mentioned in the undernoted summary continue as busy as they well could be.

There is not much that calls for particular note in connection with the year's engineering work except that the Fairfield Co., Clydebank, the London & Glasgow, Limited, and Messrs. Scott & Co., were highly successful with the machinery they turned out for the Admiralty. As regards the mercantile marine the output shows that the three crank engines with a boiler pressure ranging between 160 and 200 lbs. is still in high favour; neither the water-tube boiler nor the four-crank engine having as yet gained much ground in the merchant service. There appears to have been an extraordinary demand for the smaller type of marine engines, such as are required for steam trawlers, yachts and launches, as from the returns of six firms below, viz., Messrs. Muir & Houston, Limited, Bow, McLachlan & Co., Ross & Duncan, McKie & Baxter, Campbell & Calderwood, and Shanks, Anderson & Co., it is seen that no fewer than 164 sets have been turned out amongst them, or one set of engines per fortnight for each firm; surely a record in itself! Leaving aside Messrs. Muir & Houston, Limited, the bulk of whose work was made up of triple engines for trawlers, the greater number of these sets were small compound engines of every conceivable type, surface-condensing, jet-condensing and non-condensing. Details of the output, alongside of which for comparison we place those for 1897, are as follows:—

		1898.	1897.
Firm.	Sets.	I.H.P.	I.H.P.
Fairfield Co.	9	74,300	39,200
Clydebank Co.	10	72,300	55,300
Denny & Co.	15	30,120	40,500
Scott & Co.	9	27,500	1,000
Muir & Houston	45	22,800	20,200
Caird & Co.	4	21,400	20,000
Dunsmuir & Jackson	10	21,200	22,050
Bow, M'Lachlan & Co.	35	17,720	5,960
D. Rowan & Son	12	17,050	16,100
Barclay, Curle & Co.	8	16,245	15,300
Hutson & Son	16	16,000	8,600
R. Napier & Sons	4	14,600	10,350
London & Glasgow Co.	3	13,900	7,000
Ross & Duncan	31	13,250	7,000
A. Stephen & Sons	6	12,700	12,600
D. & W. Henderson	6	12,600	15,000
Lobnitz & Co.	17	12,580	9,325
Hall-Brown, Buttery & Co.	11	12,045	7,450
J. G. Kincaid & Co.	13	11,390	11,740
A. & J. Inglis	7	10,800	4,600
Simons & Co.	10	10,650	10,600
Rankin & Blackmore	5	9,200	10,100
Blackwood & Gordon	6	8,600	6,500
Fleming & Ferguson	9	6,800	8,300
M'Kie & Baxter	21	4,820	1,850
D. J. Dunlop & Co.	2	3,000	1,500
Campbell & Calderwood	19	2,595	840
Shanks, Anderson & Co.	13	1,900	1,795
Lees, Anderson & Co.	3	1,630	1,505
Alley & MacLellan	1	110	600
Other firms	21	11,000	330
	382	510,815	373,195

Some of the firms in the above list, and others who are not mentioned, have during the year turned out a considerable amount of marine engine accessories and deck machinery. Messrs. James Howden & Co., who do not now make marine engines, but find all their resources taxed in supplying apparatus in connection with their system of forced draught for marine boilers, have now removed to their new works and offices in Scotland Street, which have been erected for the better carrying out of their forced draught specialties. The firm are very busy, the amount of work done during the past year being considerably more than in any previous year. Nearly all the cargo steamers now built use their patent system of forced draught which is also being used in almost every first-class passenger liner. The ships which will, when completed, be the largest and fastest steamers in the world, are amongst their later contracts. Messrs. Bow, McLachlan & Co., Paisley, have finished steam-steering gears for the following vessels of the British Admiralty:—*Andromeda, Ariadne, Argonaut, Amphitrite, Express, Diligent, Gladiator, Pomone, Pegasus, Pyramus, Orwell, Spartiate*, and *Pandora*.

Messrs. Napier Bros., Limited, Lancefield Street, Glasgow, have turned out during the year a large amount of work in windlass gears, capstan gears, steering gears, and boat-hoisting winches for vessels for the Admiralty, the North German Lloyd, Austrian Lloyd's, the Castle Line, the Royal Mail Steam Packet Co., the Japanese Mail S.S. Co., Limited, and several other well-known steamship lines. The largest cable gear that has ever been made is now being fitted by the firm on the White Star Liner *Oceanic*, at Messrs. Harland & Wolff's, Belfast, the cable being 3½ in. in diameter. The gear is similar in construction to that supplied by Messrs. Napier Bros. to the Cunard liners *Campania* and *Lucania*, and to the North German Lloyd's new mail steamers *Kaiser Wilhelm der Grosse* and *Kaiser Friederich*. At present the establishment is working night and day, on gears required for British battleships and cruisers, and also for the Castle Line, Allan Line, &c., and which will keep it busy all next year. The firm supplied their windlass and capstan gears and steering gears, &c., to vessels of an aggregate tonnage of over a quarter of a million during the year. On hand are six cruisers and four battleships to fit with their gears, besides several of the mercantile marine.

The work on hand throughout Clyde yards amounts roughly speaking to 544,000 tons; far and away the biggest total in the industrial history of the river. Of this total about 310,000 tons are located in yards below Clydebank, viz., in Dumbarton, Port-Glasgow, Greenock, Troon, Ayr, Campbeltown, &c., the two districts of Greenock and Port-Glasgow of themselves—as has been noted—having some 240,000 tons. Much of the work, however, is pretty far advanced, and the capacity for rapid production is now such that in order to maintain the degree of briskness existing, orders should constantly be forthcoming. One very significant and hopeful sign is seen in the fact that nearly all the more important firms are not only enlarging their yards but increasing the accommodation for building bigger boats. Of the work on hand, the best in point of class is at Fairfield, Clydebank, Dumbarton, and Greenock.

At Fairfield there are the armoured cruisers *Cressy* and *Aboukir* on the stocks, and two fast twin-screw steamers for the Castle Line. The second-class cruisers *Hermes* and *Highflyer* and the destroyer *Leven*, are still undergoing completion in the firm's dock. At the yard in Govan of Messrs. Mackie & Thomson there are as many trawlers building as the yard can hold, and in other upper reach yards much the same state of matters prevails. The London and Glasgow Co., Govan, have on hand H.M.S. *Thistle*, a gunboat like the *Dwarf*, which figures in their return for this year, two paddle tugs each of 700 tons displacement, and 1,300 I.H.P. for the Admiralty, and two screw steamers each of 4,700 tons gross, for Glasgow owners. At Clydebank there are the Japanese battleship *Asahi*, the British cruisers *Sutlej* and *Bacchante*, a big cargo boat for the Cunard Line, and two large twin-screw steamers for the Red Star Line. The two latter have not their keels laid as yet, and *Asahi* is to be launched in the Spring.

Messrs. Denny Bros., Dumbarton, have four steamers and five small barges on the stocks—about 21,000 tons—and at least 38,000 tons to go on with. Messrs. McMillan & Sons, of the same town, have building and on hand about 19,000 tons. Two large steamers for the P & O Line are under construction by Messrs. Caird & Co., Greenock. An intermediate boat for the same service, and two vessels for service in the Pacific are also on hand. Messrs. Scott & Co. have three steamers and two steam yachts to build, Messrs. Carmichael, McLean & Co. half-a-dozen steamers of about 16,000 tons, and Messrs. Taylor & Mitchell three steamers of about 4,000 tons. The Ailsa Shipbuilding Co., Troon, have three steam yachts and six screw steamers of an aggregate gross tonnage of 6,080. At the Paisley and Renfrew yards the shops are very busy and likely to be for some considerable time.

Leith and Grangemouth on the Forth, and the Fifeshire ports of Kinghorn and Inverkeithing, together launched 31 steamers of 26,264 tons, as compared with 30 of 13,235 tons, practically a doubling of the output with the same number of vessels. Messrs. Ramage & Ferguson produced 7 steamers of 10,267 tons, one of these being of 4,110 tons, the largest ever sent off the stocks at Leith. Their output the year previous only amounted to 4,543 tons. The Grangemouth Dockyard Co., put out 7 vessels of 8,050 tons, as compared with 2907 tons in 1897. Messrs. John Scott & Co., Kinghorn, launched 4 steamers of 6,022 tons, as compared with 3,685 tons in 1897. Messrs. Cumming & Ellis, Inverkeithing, turned out 6 vessels of 1,291 tons, as compared with 1,170 tons.

Messrs. Hawthorns & Co. launched 994 tons as against 930 tons in 1897. This firm have on the stocks at present a twin-screw steamer for the Northern Lighthouse Board. New machinery was fitted on the trawler *La Vogue*, built by Messrs. Cochrane & Cooper, of Grimsby, for Belgian owners, the engines being triple-expansion, 350 I.H.P., also new machinery was made for the passenger steamer *Countess of Breadalbane* on Loch Awe, over 200 I.H.P., and illustrated in our issue for September last. A large number of extensive repairs to hulls and machinery have been executed during the year, and at present the firm have a number of vessels in hand for large overhauls. Messrs. S. & H. Morton & Co. have been fairly well employed during the year with new work, besides executing a considerable quantity of ship repairs. Messrs. John Cran & Co. completed six sets of engines of the smaller class for launches and trawlers, and have on hand other six sets. Messrs. Menzies & Co., were busy with repairing and engineering and boiler work. During the year they overhauled H.M.S. *Caledonia* and carried out extensive repairs on H.M.S. *Redwing*, besides completing a fairly large contract for boats for the Admiralty.

Dundee shipbuilding during the year just ended shows an improvement over 1897, but the total is still a long way off the record of 1892, viz., 22,300 tons, and 1890 of 23,474 tons. The output for 1898 consists of 23 steamers and 5 barges, possessing a combined gross tonnage of 14,292, as compared with 13,124 tons for 1897. The output has been provided by three firms, viz., Messrs. Gourlay Bros. & Co., who launched five vessels of 6,700 tons; the Caledon Shipbuilding and Engineering Co., 10 vessels of 6,432 tons: and the Dundee Shipbuilding Co., six vessels of 1,160 tons. Marine engineering has also been brisk during the year, the output representing 9,580 I.H.P. Besides the above-named firms Messrs. Cooper & Greig produced five sets of triple-expansion engines, each 60 N.H.P., for Grimsby owners, a further set of 63 N.H.P. for London owners, and a triple set of 120 N.H.P. for foreign owners. The shipbuilding work at present on hand amounts to about 26,000 tons, and the prospects of the coming year are therefore very bright.

At Aberdeen shipbuilding during the year has been busier than it has been since the present decade began. The output has been 28 vessels of 7,450 tons, as compared with 5,350 tons last year. Contributing to the aggregate were Messrs. Hall, Russell & Co., who turned out nine vessels of 4,080 tons; Alex. Hall & Co., seven vessels of 1,215 tons, and Messrs. Duthie, Sons & Co., 12 vessels of 2,115 tons. The larger number of the vessels were steam trawlers of from 150 to 180 tons, but the output of the first-named firm included two steamers of larger tonnage, viz., the *Diamante* of 2,000 tons and 1.800 H.P., and the *Bolivar* of 1,015 tons. The same firm have on hand a screw steamer of 4,545 tons gross, and 4,300 I.H.P., and also one of 2,950 tons, and 2,500 I.H.P., both for local owners, also six steam trawlers. Messrs. Alex. Hall & Co. have six steam trawlers on hand, and Messrs. Duthie have on hand 13 trawlers. The latter firm, who recently entered into occupancy of the shipyard at Montrose, have also on hand there other 11 trawlers. The work on hand at Aberdeen amounts in all to about 12,000 tons, a full year's work.

Mr. F. W. Paul, manager of Blochairn Steel Works, and president of the West of Scotland Iron and Steel Institute, in the course of his reply to the toast of the " the Institute," given at the annual dinner, held in Glasgow on the 10th ult., referred at some length to the subject of American competition in steel manufacture and to the general prosperity and extent of the operations in the iron and steel industry in the West of Scotland. In considering how they stood with regard to the competition of America in steel plates and boilers, he said that at the meeting of the American Naval architects and marine engineers held at New York in November, the President in his address declared that "ship steel has been exported to Great Britain this year on its merits as to quality and cost." An ominous paragraph had also been appearing in home journals which said, "American manufacturers of shipbuilding material seem to be gaining a foothold for their products in Denmark. Jules Bloom, Vice and Deputy Consul at Copenhagen, in a recent letter to the State Department, says that several shipbuilders of Denmark who formerly secured their supplies exclusively from Scotland, have within the past few months placed orders for plates and angles with American firms, and he ventures the opinion that if their trial orders are fulfilled in a satisfactory manner the market will be gained permanently.' These two paragraphs, coupled with what they had heard recently, were sufficiently alarming to demand the serious attention of pig-iron and steel makers in this country.

But to avoid being scared with panic, it would be well to point out that there was an inherent shortcoming in the basic open hearth process, that of irregularity in quality, and on that account it was unlikely that American basic steel would supplant the magnificent steel which was made in this country by the acid open-hearth process, except in structures where strength is of little importance. The strength of a chain was measured by its weakest link, and any structure built of basic steel plates, varying in tensile strength from about 22 tons to 30 tons, would require to be designed to meet that weakness. Unless each plate were tested—as was the practice in this country, by Board of Trade and Lloyd's with regard to boiler plates—it would be futile to ensure the regularity of quality in delivery of basic steel plates and angles. There was at the present time a rumour that steel manufacturers in America had had considerable difficulty in fulfilling orders for Great Britain owing to frequent rejections in meeting the requirements of such tests as those of Lloyd's Register and other societies, which, as was well known, the manufacturers in this country had no difficulty in complying with. But notwithstanding, it would be well to be prepared to meet serious competition from America. If the pig-iron manufacturers, whose interests were identical with those of steel manufacturers, could supply pig-iron at a price—should necessity arise—at all corresponding to the price ruling in America, there need be no fear. This, however, would necessitate considerable reduction in price of ore and economics in manufacture, so that it behoved all to give this matter full consideration.

Proceeding, Mr. Paul referred to one fact as indicating the great strides which Scotland was taking in the manufacture of steel. Everyone in the West of Scotland district had rejoiced equally with the gentleman who had lately crowned his metallurgical achievements in the manufacture of armour plates with such marked success. He referred to the new process which had been initiated, developed, and brought to perfection at the Parkhead Forge by Mr. William Beardmore. At present there were 82 blast furnaces in operation, as compared with 75 in the corresponding period of last year, and it was computed the total make of pig-iron for 1898 would be about 1,300,000 tons; open-hearth acid steel 835,000 tons; malleable iron 200,000 tons. The total output was 2,335,000 tons. These figures were most satisfactory. In the manufacture of the total output of pig-iron, malleable iron and steel, there had been consumed about 3¼ million tons of coal and 2¾ million tons of ore. From such figures they could appreciate the importance of the industry.

An order has been placed, during the past month, with the Haythorn Tubulous Boiler Syndicate, Glasgow, to supply, for the saloon excursion steamer *Lorna Doone*, belonging to the Southampton, Isle of Wight and South of England Royal Mail Steam Packet Co., Limited, three of their patent water-tube boilers, capable of generating steam for about 1,700 I.H.P., similar in design to the boilers fitted, over eight months ago, to the Clyde passenger steamer *Meg Merrilees*, belonging to the Caledonian Steam Packet Co. The working of the boilers on board this vessel has been so thoroughly satisfactory that Mr. C. W. Murray, the consulting engineer for the Isle of Wight Co., has strongly recommended their adoption on board the *Lorna Doone*. The contract for the necessary alterations to machinery space, and repairs to hull and machinery, has been secured by Messrs. J. Samuel White & Co., Limited, of Cowes, Isle of Wight, at whose yard the vessel is now lying. The *Meg Merrilees* was the first purely passenger steamer plying for hire in home waters to be fitted with water-tube boilers, and the officials of the Board of Trade have all along taken a close interest in the working of the Haythorn boilers on board, renewing the three-monthly period of their certification of the vessel as it expired. The step now taken by the Isle of Wight and South of England Steam Packet Co. may therefore be regarded as indicating not only the success of the Haythorn type of boiler, but also the encouraging attitude of the Board of Trade towards the water-tube boiler on board passenger steamers.

THE TYNE, WEAR, TEES, HARTLEPOOLS, &c.

(*From our own Correspondent.*)

THE YEAR'S SHIPBUILDING.

At the time of writing the returns of tonnage launched throughout the district of the North-East Coast have been completed, and it is therefore possible to speak with certainty of the increase of output in 1898, as compared with previous years. The figures show a very large increase over anything previously done, and the increase is not confined to a few specially favoured seats of shipbuilding, but is distributed in tolerably even proportions over all. One cause of the increase has hardly been taken sufficiently into account by contemporary reviewers of the situation, and that is the fact that a very large number of the vessels launched in 1898 had been well advanced in construction before the close of 1897, and had been purposely delayed because of the impossibility of getting engines for them while the engineers' strike was unsettled. To state the matter in other words, a good part of the tonnage credited to 1898, really belongs to 1897. Making every allowance for this, however, the increase of output in 1898 is remarkable, and is a thing upon which both employers and workmen may well be congratulated.

Several circumstances combined to bring about the brisk demand for new ships which was manifested early in the year, and which has been well sustained to the end. The prospective opening out of new routes of commerce, and the actual inauguration of several new enterprises of the kind indicated, helped in no inconsiderable degree to swell the volume of trade in shipbuilding. But the most important factor in producing the boom was, doubtless, the circumstance that a large proportion of the tonnage in existence was antiquated and had to be superseded. Losses by collision and wreck had also to be made good, and the unusually large requirements of our own and other Governments in defensive armaments, caused an additional strain upon the resources of private builders. In shipbuilding circles there now appears to be a consensus of opinion that the present prosperity will last for at least another year; but it is feared that the early years of the new century will be a time of dearth in shipbuilding as well as in other industries.

A feature of the year's business has been the marked increase in the average size of new ships. As time goes on this feature will become still more prominently noticeable, for large steamers can be more economically worked than small ones, and this year there have been vessels ordered on the North-East Coast which in point of size are far in excess of any hitherto laid down in any yard of the district. There is a limit to all things however, and doubtless the limit in the size of ships will soon be reached, for, advantageous as they may be in point of economical working, vessels of the abnormally large type are obviously more exposed to the dangers of collision and grounding than smaller craft, and they are certainly less adaptable for transference from one service to another.

The year was luckily free from labour disputes, a circumstance which also helped the output. There were, however, many complaints regarding the irregular attendance of the workmen, and so keenly felt was this grievance by the employers, that before they would finally settle the terms of a wages advance demanded by one of the leading trade societies, they stipulated that the officials of the latter would have to exercise pressure upon the men to make them attend more regularly to work. That the leaders promised to do their best in the matter—and meant what they said—there is no gainsaying; but that their success has been of a very equivocal kind, seems equally certain. Though this bargain was made about midsummer, we find that in the December report of the society referred to, the Executive Council are still complaining about the inattention to their work shown by a portion of the members, to the detriment of "good employers." With regard to these members, the Executive say that their conduct is "shameful," and that they "ought to be punished by branch or district committees." This is the Executive of the strongest and (by all accounts) most ably conducted trade union in existence, and though its members were primarily parties to the aforesaid bargain, they now desire to relegate their authority for the purpose of punishing the "ne'er do wells," to the branch or district committees. They are not particular, it would seem, who undertakes the job, so long as the responsibility is shifted from their own shoulders. One cannot say much for the manner in which trade unions generally are conducted when this is the way in which things are done, in what is (by common repute) the best of them.

By the evidence of their accredited organs we are forced to the conclusion that if there has been a record output this year, it is not in any way to be attributed to the improved habits of the workmen. What then is it that has enabled the employers to get through such an enormous amount of work? There is but one answer to this query, and that is, the immense strides that have been made of late in the improvement of machinery, and working accessories generally. Hydraulic power has been brought largely into requisition to supplement the steam power in use, and now electrical power has been introduced to put into the shade all other sources of mechanical energy. The possibilities of electrical transmission are almost limitless, and there is little reason to doubt that in the course of a very few years, the greater part, if not the whole, of the machinery in shipyards and engine works, will be kept going by the electric current.

It is no slight honour to the North-East Coast that two shipbuilding firms of the district—one at the Hartlepools and the other on the Tyne—hold first and second place respectively, on the list of the output returns of the United Kingdom. Messrs. W. Gray & Co., West Hartlepool, came first with 72,323 tons, and Messrs. C. S. Swan and Hunter, Wallsend, second with 68,695 tons. Had it not been for the intervention of the great Belfast firm—Messrs. Harland and Wolff—a Tyneside firm would have taken third place; but it is no discredit to even so important a firm as Messrs. Armstrong, Whitworth & Co., to have to occupy a place below the Belfast firm, and be only fourth on the list, with the large output of 54,397 tons. It is but fair to say with reference to the three North-East Coast firms, that the first has three well equipped yards in operation, and the others two yards each. Messrs. Gray's yards are all contiguously situated, and so are Messrs. Swan and Hunter's, but the yards of Messrs. Armstrong, Whitworth & Co., lie some half-dozen miles apart, one being at Elswick, and the other at Walker.

Recurring to the general features of the year's work, we find that foreign orders have again been pretty largely distributed among the leading builders, vessels having been built at one or other of the North-Eastern centres for almost all nationalities, including France, Italy, Germany, Russia, Norway, and Japan. In spite of the growing competition of other countries we believe that the foreign proportion of our yearly shipbuilding contracts can not only be maintained, but extended, provided those most interested in the welfare of the trade do their obvious duty. The employers should more than ever bestir themselves to perfect their plant and accessories, and the workmen should stick to their work manfully and persistently while there is work for them to do. Independently of the irregular attendance arising from the irregular habits before referred to, there is unfortunately a disposition among workmen (the product of recent years) to make every small incident, or change of weather, a pretext for stopping work, or refraining to start. This is unquestionably a sign of deterioration, and all who have the interest of the workmen at heart should do what they can to check the growth of this excessive care for self, which is very nearly akin to laziness. It does not need any stimulus from the outside to stir the employers to energetic action in making their productive resources as effective as possible. All the employers who have earned their titles to pre-eminence by successes achieved are doing all that is possible in the direction indicated, and the laggards *must* follow suit or be content to be out-distanced, and eventually to drop out of the race.

One of the incidents of the year, which must not be passed over in silence, was the starting of the Northumberland shipbuilding yard at Howdon after having been unoccupied for a number of years. The firm who have taken this yard in hand appear to have been very successful, having secured some exceptionally important orders, and having had the rare good fortune of securing an adequate supply of skilled labour at a time when most of the older establishments were "short-handed." It was a good time to start the business of shipbuilding, when the tide of prosperity was flowing strongly, and when, instead of having to seek orders with assiduity in all places where they were likely to be had, orders were being pressed upon all who were capable of fulfilling them. We hope that this convenient and admirably situated yard will never again present the scene of desolateness that was to be witnessed there at this time last year. The fact that the direction of the establishment is now in capable hands offers some guarantee that this will not be so, and we cannot help cherishing the conviction that the establishment has a prosperous future before it.

The opening of a new graving dock at Blyth was also a notable event, particularly as it is a dock of the very largest capacity, with a complete equipment of the best modern appliances for facilitating the work of docking and undocking. The Blyth Dry Dock Co., Limited, to whom this dock belongs, are to be congratulated upon their enterprise, which has supplied a long felt want, and is quite in keeping with the policy of progress, which is the true test of capability in business men. The dock, we are pleased to say, has done excellently since its opening, and we anticipate that it will do better still in the future.

In view of the fact that the prices of material have risen to a substantial extent, and that the cost of labour has also been enhanced considerably, it is obvious that the prices of new steamers must necessarily have gone up also. There is at present little fear of any reaction occurring, though there is a possibility of a further rise in prices taking place. It would be wise, therefore, for shipowners wanting vessels to order them *before* the market undergoes a further stiffening against them.

THE TYNE.

(From our own Correspondent.)

THE Elswick yard of the Armstrong-Whitworth Co. continues to show unflagging briskness, and night work is being carried out so far as is practicable by the aid of artificial light. It was thought that a fast cruiser, which is being built for a foreign Government, would have been ready for launching before the close of the year, but through the unfavourable weather prevailing at the end of November, construction was somewhat delayed, and the launch has had to be postponed to a date in January, 1899. Activity at the company's Low Walker yard is also fully sustained, every building berth being occupied, and the preparatory work of some three or four vessels that are to be put down when berths become vacant, being pushed forward as actively as possible. Messrs. Samuels & Co., who placed an order with this company in the summer months, for three large oil steamers, have recently ordered three others of the same lines, so that there are now six to be built. The contract for the six sets of engines is divided between the Wallsend Slipway Co., and the North-Eastern Engineering Co., Wallsend, three sets to each.

A rumour has gained currency that Messrs. Hawthorn, Leslie & Co., had received an order from the committee of the Russian Volunteer Fleet for two high-class steamers to be added to the fleet. We are not in a position to verify or contradict the statement; but there is nothing more likely than when the directors of the Volunteer Fleet want additional steamers, they will come for them to Messrs. Hawthorn, Leslie & Co., by whom, on former occasions, they have been so well served.

At Messrs. Wigham, Richardson and Co.'s yard there are five vessels of superior type on the stocks, and in the preparatory departments a good deal of activity exists. It is understood that one or two orders for delivery in 1900 have been recently booked, and many more orders could probably have been secured if the firm could have arranged for earlier delivery. With their present space and resources, however—although these are by no means inconsiderable—they could not possibly undertake more work unless on terms of late delivery, and in this respect they are not differently situated to the majority of leading firms. The very large extensions they have entered upon are, however, progressing steadily towards completion, and there is no reason to doubt that in the coming year the productive resources of the firm will be largely increased. At Messrs. Wood and Skinner's, and Messrs. Dobson's establishments, business is still very brisk, a large proportion of the work in hand in each case being on foreign account. At Messrs. Stephenson's also there is a good show of work in hand, and it is expected that the large pontoon dock, which the firm completed some time ago, and which was originally ordered by the Spanish authorities for location at the Philippines, will soon be in process of shipment to another destination.

Messrs. C. S. Swan and Hunter, who occupy the proud position of second on the output returns, seem determined to claim a high place next year also, for they are losing no time in filling the places of vessels as fast as they are launched, so that no empty berths are, at any time, to be seen. The firm are also continually making improvements, although it is difficult, at any particular time, to see what further improvement can be made. Their object, apparently, is to adapt their arrangements to new conditions as they arise, and in this they seem to be successful. The Tyne Iron and Shipbuilding Co. are fitting out at the yard wharf, the fine steamer *Sirdar*, which has been built to the order of a Newcastle firm, and they have on the stocks three other vessels of large size, besides some in the preparatory stages.

The Palmer Shipbuilding and Iron Co., Limited, have still to keep a night shift on in their frame-turning department, and by this means delays are avoided in filling the places of vessels launched. The company have a number of vessels in the water being fitted out, amongst which may be mentioned the fine steamer *Crewe Hall*, which has been built to the order of Messrs. Alexander, of Liverpool. A report just to hand of the first trial of the torpedo-boat destroyer *Flirt*—the eighth 30-knot destroyer supplied by Messrs. Palmer to the Admiralty—is satisfactory so far as that in foggy weather and in shoal water, the vessel made a speed somewhat in excess of requirements.

At Messrs. Redhead's yard, and also in their graving dock department, business is exceedingly brisk, and in the smaller yards further down the river a fair degree of activity is maintained.

Engineering.—The Wallsend Slipway and Engineering Co. have a number of important orders to commence the year with, among them being the duplicate engines for the recently ordered ice-breaker building at the yard of Messrs. Armstrong, Whitworth & Co., at Low Walker. We learn that this vessel which approximates somewhat to the *Sampo* in size and power, has been ordered for service at Odessa. At the St. Peter's Works, and also at the Neptune Works, and at Palmer's, business is exceedingly brisk, while at Messrs. Redhead's, and some smaller establishments nearer the mouth of the river, there is as much work in hand as can be dealt with. Locomotive engineering works are fully supplied with orders, and to such an extent has the pressure of work manifested itself, that some large orders (it is said) have had to be sent out of the country. In general engineering there is also great activity, and the Armstrong-Whitworth Company are, it is understood, contemplating immense developments at their Elswick works. Among the new fields of enterprise to which the company, it is said, are directing their attention, being the manufacture of steel plates for shipbuilding and other purposes. It is also considered probable that they will put down plant for the manufacture of armour plates, and even what is suggested here does not seem to cover the full scope of their projects. All the departments of the existing works, including steel, ordnance, gun carriage, boiler and bridge works, are, and have been for months past at the very acme of briskness, and this condition is not likely to be altered for a long time to come.

At the works of Messrs. Clark, Chapman & Co., great activity prevails, the electrical department particularly being well supplied with orders.

Messrs. Emmerson, Walker, & Thompson Bros. are also very busy, and at Messrs. Harfields, Blaydon, all the resources of the establishment are taxed to keep pace with requirements. Messrs. Carrick & Wardale, Gateshead, are experiencing a large demand for their well-known bilge and ballast pumps, and their output in this line during 1898 has greatly exceeded the output of previous years.

Messrs. Wm. Hindson & Co., anchor manufacturers and hydraulic and general engineers, are doing extremely well, and have in hand some very massive anchors, which are intended for warships and other vessels of special types. This firm have excellent facilities for the repairing of steamers' engines, boilers and internal fittings, and have carried out many contracts of this kind to the satisfaction of the owners.

Messrs. Crosier, Stephens & Co., of No. 2, Collingwood Street, Newcastle, report that since the resumption of work in the engineering trade, after the prolonged labour dispute, they have found a revival of demand for their specialities, which are chiefly appliances for promoting efficiency and economy in the generation, transmission, and application of power. They have also opened up increased trade abroad (particularly with new countries) for their stampings and Cromil toughened aluminium. A gentleman is now *en route* for Cape Town, where, as agent for Messrs. Crosier, Stephens & Co., he will seek to develop business which they have already opened out in the South African markets.

Mr. L. Rusden, the local agent for Deighton's Patent Flue & Tube Co., Leeds, has been very successful during the latter part of the year in developing the demand for this newest type of corrugated furnace, which has been tested under Board of Trade regulations, with the result that the company are entitled to use the "highest constant" formula in reference to it. It may be stated that twelve furnaces of the Deighton type are to be fitted to the new boilers, which are about being placed in the General Steam Navigation Co.'s fast steamer *Seamew*, by a Dundee firm.

The Cedervall patent box for the protection of propeller shafts, has been fitted to a number of new steamers lately, among which may be mentioned the s.s. *Queen Wilhelmina*, belonging to Messrs. Pinckney, Sunderland, which made a most successful maiden voyage to America and back, in November. Another vessel fitted was the s.s. *Abergeldie*, belonging to the Adam Steamship Co., Aberdeen, which had a most satisfactory trial on the 14th of December. The Newcastle agent, Mr. Noble, of 7, Dean Street, has a good many forward orders, and the inquiries coming to hand are increasing steadily in number.

In the iron foundries and forges of the district business continues brisk, and both brass and copper works are kept actively going. Manufacturers of ships' ventilators, tanks, signal lamps, &c., are having as much work as they can deal with, and in other trades connected with steamship equipment, business is equally brisk.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—The prospective removal of the business of a well-known shipbuilding firm from the South Dock to a more suitable site, which was in last month's Notes referred to as a rumour, turns out to be correct, and the name of the firm (which may now be given without hesitation) is Messrs. Bartram & Sons. The firm have acquired a suitable piece of land midway between Messrs. Priestman's yard and the dismantled Castletown steel works, and instead of being hemmed in by a dock entrance at one side, and a rival shipbuilding yard on the other—as in their present situation—will here have ample scope for developing their business. A considerable time, however, must elapse before they can commence operations on the new ground, for it will require the carrying out of much preparatory work in the way of clearing and levelling, before even a machine can be placed in position. As this will be absolutely a new yard, it may be presumed that all modern improvements in the arrangement of machinery will be introduced, and that the machinery itself will be thoroughly up to date. In the meantime, the firm are going on with the work the same as usual, in the old premises at the South Dock, and will probably build half-a-dozen more of the big type ships they are accustomed to turn out, before they remove to the new scene of operations.

It is understood that the Sunderland Shipbuilding Co. have received an order for two superior type of steamers from a London firm, and having other orders of importance on their books, are likely to make the last year of the century a record one, so far as their output is concerned.

The five large berths at the North Sands Yard (Messrs. J. L. Thompson & Sons) are all occupied, most of the vessels being in early stages of construction. The firm have retained in 1898 the premier position in the matter of output, which they have so long held, and which in all probability will remain with them for many a year to come. It is a position which the firm undoubtedly deserve to hold, for they have been pioneers in shipyard improvements, and have been among the first to substitute order and efficiency in working for the crude and haphazard methods of twenty-five years ago. We think we are right in saying that this was the first Wearside firm to utilise hydraulic power in shipbuilding, and this is not the only matter in which they have taken the lead, and indicated the way to be followed. The firm have several important contracts to proceed with in 1899, and will probably even better the past year's output, if the workmen will only keep good time.

At Sir James Laing's Yard the berths are fully occupied, and the new machine shop which is being erected in the East Yard is almost ready for a commencement of work. Messrs. Robert Thompson & Sons have three large vessels building at their Southwick Yard, and have just launched a small vessel (sideways) at the Bridge Dock. The latter was ordered by Liverpool owners, and is named the *Frekington*.

The yards on the higher reaches of the river are all busy, with perhaps the single exception of Messrs. Osborne & Graham's, in which there does not seem to be a great abundance of work.

Engineering.—We are glad to be able to announce a further forward movement on the part of Messrs. Dickinson, of the Palmer's Hill Works, who have acquired possession of a large piece of ground adjoining their works, which is admirably adapted for extension purposes. This is the site formerly occupied by Messrs. Robson's sawmills and timber yard, the latter firm having removed to premises in Portobello Lane. There is reason to expect that the new possessors will utilise this extensive area for extensions of their boiler and engineering works, though, of course, they may possibly wait till the existing heavy pressure of work in the shops is somewhat lessened before commencing building work.

At the Southwick Engine Works business continues brisk, among the orders in hand being (it is said) one for a set of engines, &c., for a vessel building in France. The North-Eastern Engine Works, and Messrs. Doxford's, are kept going to their utmost capacity, and at all the smaller works trade is good.

Mr. Wm. Mills, brass and aluminium founder, of the Atlas Works, Monkwearmouth, is exceedingly busy with the manufacture of steamers' saloon and cabin fittings, in both aluminium and brass. The former metal is particularly well suited for the purpose indicated, not only on account of its neat appearance, but because of its extreme lightness. Mr. Mills has lately obtained some important contracts to supply brass fittings for boilers, &c., to local engineering firms.

The Hartlepools.—This ancient port has the distinction this year of being identified with the record of the largest shipbuilding output ever accomplished in 12 months by one firm. To put over 72,000 tons of shipping into the water in the time mentioned was certainly a great achievement, even though the machinery and appliances of three yards were involved in the work. The whole of it was done, however, under one organisation, and both principals and officials deserve every credit for the result attained.

The extension of the engine shops and brass finishing shop, which was in progress during the recent unfortunate dispute with the engineers, was completed during the year just passed, and has assisted in materially increasing the output of the Central Marine Works to meet the addition to Messrs. Wm. Gray & Co.'s Central Shipyard. The result has been that during the twelve months, the number and the average size of the engines turned out, show a decided increase over any former year of the Central Marine Work's history. Besides the ordinary triple-expansion engines, there have been three unusually large sets of machinery built for the Atlantic trade, which have been fitted in the steamers *Chicago*, *Mount Royal*, and *Mancunia*. The total output of the works for the year was 29 sets of machinery, of 47,300 I.H.P., as against 22 sets of 27,350 I.H.P. in 1897, and 18 sets of 24,950 I.H.P. in 1896. In the boiler department, besides 60 boilers for the engines referred to, 15 other marine boilers of various types and sizes have been built, making altogether 75 boilers turned out during the year. For the coming year a large amount of work is in hand, including a repetition of Mudd's patent five-crank engines, as fitted in the s.s. *Inchmona*, and a powerful set of twin-screw engines for an Atlantic liner. It may be added that the number of men employed at the Central Marine Works is larger than at any previous time.

The Tees.—At both Stockton and Middlesbro' the shipyards will commence the New Year with an abundance of work on the stocks, and in the marine engineering works a similar condition of affairs may be said to exist. The smaller engineering works, as also the boiler works, bridge yards, and foundries, are as busy as possible, and in the steel works the activity that has existed for many months past is fully maintained.

THE MERSEY.

(From our own Correspondent.)

THE year that has just closed has been of an altogether exceptional character so far as the marine and general engineering, iron, and coal trades of this district are concerned. At its opening the protracted engineers' strike was still in progress. All efforts to bring about a settlement had so far failed and a continued increase was recorded in the number of firms resisting the workmen's demands. This necessarily gave somewhat a gloomy outlook to the immediate future. The end of January, however, brought the struggle to a close, by the practical submission of the workmen's unions, and there has since followed a period of almost unprecedented activity throughout practically every section of the engineering industry, which has necessarily extended to the iron and steel trade, and to a lesser degree to the coal trade.

A noticeable feature in the engineering trade has been the absence, following on the settlement of the engineering dispute, of any serious friction between employers and workmen with respect to questions of labour and wages. From time to time, as could only be expected during a period of such exceptional prosperity, questions of hours, wages, and shop regulations have been brought to the front by the workmen, but these have been invariably amicably settled by reference to the executive authorities representing the employers and the workmen, in accordance with the agreement arrived at in January on the termination of the lock-out and strike, and for the trade to have *gone through the great pressure of* activity of the past eleven months with absolute quietude encourages the hope of a better relationship between capital and labour than has previously been found to exist.

The engineering trades, as already stated, opened the year with anything but a satisfactory outlook, and even after the dispute was brought to an end, fully another month elapsed before works could be said to have got into full operation. For a period, works were chiefly engaged in finishing as rapidly as possible orders they had been able to partially proceed with during the stoppage, and for a time comparatively few new orders could be booked. A heavy accumulation of orders held in abeyance during the strike was, however, waiting, and pressing to be put in hand, whilst the revival of trade and industrial enterprise all through the country brought forward further large requirements for every description of machine-tools and general engineering plant, which very speedily filled up the books of all the principal firms not only over the remainder of the year but far into the succeeding twelve months.

The machine-tool making trade, in which Lancashire holds a foremost position, has not for a long period experienced so great a pressure of work, both in the light and heavy departments, and the situation has been very much the same throughout all the other leading engineering industries of the district. The boiler making trade, of which Lancashire is perhaps the most important centre in the kingdom, has never before been so busy; the locomotive building trade, although not now so important a branch of industry in this district as formerly, has secured an almost unprecedented quantity of both home and foreign work that has filled up the shops right on to the end of the present year, and builders of both steam and gas stationary engines of all descriptions have been exceptionally well supplied with orders, in most cases closing the year with their books well filled for some time ahead.

The enormous development of electricity, in its application to lighting and for motive power, has necessarily given a great stimulus to electrical engineering in all its branches, and many of the Lancashire works have been quite unable to keep up with the pressure of orders they have had to meet. In hydraulic engineering there has also been more than the average activity, and this also applies to the numerous smaller general branches of engineering industry. With this almost unparalleled activity, extensions and reorganisations of works have been pushed forward in all directions, and a noticeable feature has been the increased attention paid to electricity as a motive power not only for crane work—where it is rapidly supplanting old methods—but for driving all the general tools and plant of large engineering establishments, one important local firm having adopted electricity exclusively both for lighting and driving, whilst in one or two other large works in the district arrangements on similar lines are at present in progress.

With regard to shipbuilding on the Mersey it can scarcely be said that there has been any special activity, at any rate so far as the Liverpool side is concerned. To some extent this is attributed to special circumstances, and it is certainly in striking contrast with the position at Barrow, where the records of all previous years have been beaten, and in fact with the condition of the shipbuilding trade throughout other parts of the country, where the pressure of work has been the greatest ever known. The decadence of this branch of industry on the Mersey is attributed by one firm to the "combination of workmen, and the action of the Mersey Docks and Harbour Board," and he quotes in contrast the example of German and French ports, where, he states, everything is done to increase this and kindred trades.

Turning to the actual particulars of work done, Messrs. Laird Bros., of Birkenhead, have during the year launched two vessels—the *Princess of Wales*, a steel paddle steamer of 1,009 gross tons register, compound engines of 4,000 H.P., and a speed of 19 knots, built for British owners; and the H.M.S. *Orwell*, a steel twin-screw vessel of 320 gross tons, with triple-expansion engines of 6,000 I.H.P., and a speed of 30 knots. The firm have also had in progress H.M. first-class battleship *Glory*, which they hope to float during the spring of 1899; H.M. torpedo-boat destroyer *Express*, now undergoing preliminary trials; H.M. sloops *Mutine* and *Rinaldo*, of 980 tons displacement, and 1,400 H.P., which are now in frame; a fast paddle-steamer (for a Cross Channel Service) of 1,440 tons displacement and 5,500 H.P., and a 30-knot torpedo-boat destroyer for a foreign government, both of these latter vessels being in an early stage of construction. On the Liverpool side, Messrs. W. H. Potter & Sons have launched a British man-of-war, viz., the gunboat *Bramble*, this being the first of two vessels on order with this firm. The *Bramble* is of steel, sheathed with wood, and is a twin-screw, working up to 1,300 H.P. A steam yacht of steel, the *Skipjack*, 84 ft. in length, has also been launched by Messrs. Potter for Sir Richard Williams Bulkeley. Messrs. John Jones & Co. have turned out eighteen steamers of small dimensions—the total tonnage being 1,857—of which fifteen are paddle steamers for passenger purposes, and the other three screw steamers. Messrs. James Harland & Co. have launched a composite sailing craft to carry 40 tons for a London gunpowder manufacturing company. Messrs. Caleb, Smith & Co., R. & J. Evans & Co., and Clover, Clayton & Co. have done repairs only during the year.

In the iron trade at the opening of the year a generally steady tone prevailed. Although the failure of all attempts to bring about a settlement of the engineers' dispute threatened to indefinitely prolong the struggle, the belief prevailed that the end was inevitably approaching, and in anticipation of an early resumption of operations there was a considerable weight of business under negotiation, whilst makers were all very firm at their full quoted rates, which for delivery by rail Manchester were on the basis of 45s. 6d. for forge and 48s. 6d. for foundry Lancashire, less 2½; 43s. for forge to 45s. 6d. for foundry Lincolnshire, net; 47s. 6d. to 48s. 6d. for foundry Derbyshire; 48s. 9d. to 49s. 3d. for foundry Middlesbrough, net; and delivered Manchester docks 49s. to 49s. 3d. for Glengarnock; 49s. 9d. to 50s. for Eglinton, and 45s. to 45s. 6d. for ordinary brands of American pig-iron, net cash. The end of January brought the great engineering strike to a close, but contrary to general expectation the termination of the dispute brought forward no very appreciably increased demand, at any rate for raw material.

As a matter of fact, during the course of the dispute there had been no really serious falling off in requirements. Most of the large establishments had been able to keep in progress their rough heavy work, on which the chief weight of material was required, and for some time after the settlement they were chiefly engaged in finishing operations for which comparatively only very small quantities of material were needed. The result was that instead of a rush of buying and a strong upward move in prices, the orders given out were mostly only of relatively small weight, and prices in place of advancing showed rather a downward tendency than otherwise. Local and district brands kept fairly steady, but in Middlesbrough a decline in prices of 9d. to 1s., and in Scotch iron of 2s. below the rates ruling at the beginning of the year took place, whilst American iron became a keen competitor, large quantities arriving from the United States and offering at the Manchester Docks at very low figures.

This state of things continued all through the first three months of the year, and the disturbed foreign outlook also tended to check any development of activity. The general tone, however, was one of confidence as to the future, as already indications were manifest of exceptional activity throughout all the principal iron-using industries, and although no actual "boom" was looked for, a large demand upon all classes of material was fully anticipated, with a steady upward move in values. With the turn of the half year these anticipations began to be realised, and a decided improvement set in, with a strong advance in prices, which was maintained right on to the close of the year. Although buyers for a time were very cautious about following the upward move, makers generally had their books so well filled, that they declined to entertain offers except at their full rates. At first the upward move was only comparatively moderate, considering the strong position of makers, the fear of affording any undue advantage to competitors abroad, both American and Continental, acting as a check upon English makers and manufacturers in definitely advancing their quotations, but with with the continued exceptional activity throughout every branch of the iron trade, makers found it more and more difficult to keep up with customers' requirements, even on account of contracts placed, whilst new business could only be entertained in limited quantities. The result was that in many cases they were driven to quote what were intended to be practically prohibitive prices, owing to their inability to enter into further engagements. In some quarters there was a disposition to question whether the advance had not gone beyond its legitimate limit, and here and there some slight underselling went on, but this by no means represented the prevailing opinion, which was rather that with no slackening off in actual consumption, and the increased cost caused by the upward move in fuel, the tendency of prices was more likely to be in an upward than in a downward direction. Generally the advance during the second half of the year represented about 3s. 6d. to 4s. on Lancashire, 4s. to 5s. on Lincolnshire and Derbyshire, about 6s. on Middlesbrough, and 5s. on Scotch, and the ordinary brands of American pig-iron, the basis quotations getting up to 51s. for forge, and 53s. 6d. for foundry; Lancashire, less 2½; 48s. 6d. to 49s. for forge; and 52s. to 52s. 6d. for foundry Lincolnshire, net cash; 54s. to 55s. for foundry Derbyshire; 54s. 4d. for foundry Middlesbrough, net by rail Manchester; with Scotch iron 55s. for Glengarnock, and 55s. 6d. for Eglinton, and American brands not quoted under 50s. to 52s. net delivered at the Manchester Docks.

The finished iron trade followed much the same course as pig iron. The tendency all through the year has been in the direction of improvement, which has resulted in a gradual upward move in prices, representing an advance during the twelve months of 17s. 6d. on bars, 10s. on hoops, and about 5s. to 7s. 6d. on sheets. At the commencement of the year prices for delivery in the Manchester district were steady on the basis of £5 12s. 6d., up to £5 15s. for Lancashire bars; £5 17s. 6d. to £6 for North Staffordshire; £6 15s. to £7 for sheets, and £6 10s. to £6 15s for hoops. In bars business steadily increased, and towards the close of the half year the Lancashire makers formed themselves into an association for the regulation of prices on much the same lines as had for several years been found to answer very satisfactorily in the hoop iron trade. This was followed, as the activity steadily increased, by successive official advances in list rates, which by the close of the year got to the basis of £6 10s., as the minimum for Lancashire bars delivered Manchester district, with makers generally well sold into February and March, and some of them declining to book except at a further advance of 2s. 6d. per ton. Hoop makers have not experienced the same briskness of demand, the American competitors having secured a large proportion of their export business, but generally the position has shown an unquestionable improvement upon that of the previous year, and prices have, by two official advances of 5s. per ton, being brought up to £7 for random, and £7 5s. for special cut lengths delivered Manchester district, and 2s. 6d. less for shipment; sheets have only shared partially in the general revival, but average quotations have risen to about £7 5s. per ton.

In the steel trade the exceptional industrial activity has, perhaps, made itself even more felt than in the iron trade, and for both raw and manufactured material there has been so great a pressure of demand that it became, eventually, less a question of price than of obtaining deliveries of material from makers and manufacturers. The advance in prices has been somewhat extraordinary, raw material having risen quite 10s. per ton, whilst some descriptions of manufactured material, such as plates, have advanced £2 per ton during the twelve months. The almost unparalleled activity in the shipbuilding and boiler making trades, both very large users of steel, with also a large weight of structural work going on in various directions, brought on the market enormous requirements for finished steel, and this necessarily involved a great consumption of raw material, the demand for both increasing as the year progressed. Ordinary foundry hematites, which at the commencement of the year were obtainable at 55s. 6d., less 2½. delivered Manchester have advanced to 65s. 6d. and 66s. 6d., less 2½, whilst local steel billets have risen from £4 5s. to £4 15s. net. In manufactured material local steel bars have advanced from £6 up to £7, and special qualities from other districts from £6 10s. to £7 5s. The most striking advance, however, has been in steel plates, common qualities, which might have been bought with the commencement of the year at £5 15s. to £5 17s. 6d, advancing to £7 12s. 6d. and £7 17s. 6d., whilst steel boiler plates, which were quoted in January at £6 2s. 6d. to £6 5s., became difficult to obtain at the close of the year under £8 5s. to £8 7s. 6d., with makers in most cases not in a position to quote for delivery within the next couple of months.

The coal trade, as already intimated, has necessarily participated to some proportionate extent in the general prosperity which during the past year has been experienced in all the principal coal-using industries, but the advance in prices has not been to anything like a corresponding extent with that in the iron and steel trades, whilst colliery owners consider that a proportion of even the limited advance that has been secured is absorbed in the increased expenditure brought about by the

Workmen's Compensation Act. Business during the earlier part of the year was anything but satisfactory, and there were prospects of heavy accumulations of stocks and possibly lower prices. The protracted South Wales strike, however, altogether altered the situation, and not only completely cleared away all surplus supplies, but kept the pits on full time during the summer, and gave a permanent hardening tendency to prices. House-fire qualities have experienced an advance of about 1s. to 1s. 3d. per ton, and renewals of contracts have only been accepted at a substantial advance on the low prices that had to be taken in 1897. All other descriptions of fuel have met with a steadily increasing demand, with a gradual hardening up in prices. The lower qualities of round coal for steam and forge purposes have advanced 1s. to 1s. 6d. per ton, the average rates with the close being about 7s 9d. to 8s. 3d. per ton, and on engine classes of fuel there has been an upward move of 10d. to 1s. 3d., common slack having risen to about 4s. and 4s. 6d.; medium 4s. 9d. to 5s.; and best sorts 5s. 3d. to 5s. 6d., with supplies exceedingly scarce, and special prices obtainable where anything like pressing new business comes forward. The important locomotive fuel and gas coal contracts have also been placed on more advantageous terms for colliery owners, who with the exceptional conditions brought about by the South Wales dispute were enabled to take up a strong position when enquiries for these came upon the market. The principal railway companies hesitated for some time about placing their contracts at the advanced rates that were asked, but they were eventually settled at an advance of 9d. per ton on the previous year's rates, the average figures being 6s. 9d. for ordinary to 7s. for better qualities of locomotive fuel. On gas coal contracts, for which prices were somewhat irregular in 1897, there was a general levelling up to the rates that had been obtainable the previous season, with here and there further advances of 3d. to 6d. per ton, the basis prices for the principal contracts being about 6s. 9d. to 7s. for the lower and 7s. 9d. to 8s. for the better descriptions of gas coal at the pit mouth.

The shipping trade, which opened the year with only a quiet tone, and plentiful supplies of steam coal offering at the ports at 8s. to 8s. 3d., continued during the first three months in only a moderate condition, with a downward tendency in prices, which got as low as 7s 6d. delivered at the ports. Suddenly, however, with the commencement of the South Wales dispute there was a rush of orders on the market, and a prompt rise in prices of 2s. 6d. per ton, with advances of 5s. quoted in some cases for special supplies, whilst on the ordinary shipping business rates were put up 1s. to 1s. 6d. During the ensuing four or five months the shipping trade fluctuated considerably, as efforts were periodically made to bring the South Wales dispute to an end, but during the greater part of this period, 10s. to 10s. 6d. was being got for good qualities of steam coal delivered Mersey ports. With the termination of the dispute prices very quickly returned to something like their normal position, and with a moderate business doing they closed the year at about 9s. to 9s. 6d. for ordinary steam coals at the ports.

THAMES.

(*From our own Correspondent.*)

THE approaching New Year appears as if it would bring in renewed activity in engineering circles. Everywhere the same story is told—"Full up with orders." Even the daily newspapers burst in with the good news at times, and notably the *Daily Mail*, which takes a patriotic interest in the matter. There can be no doubt that much of the confidences which causes orders to be placed is the consequence of the firm tone of the Government on foreign and colonial affairs. The Cape to Cairo railway being laid from each end the Victoria and Mombasa railway, the opening up of China and the new commercial interests springing up all over the East is causing a new burst of activity at home, hence the cry of full orders by all engineering firms.

The Vauxhall Iron Works Co. have many enquiries for new machines. The experiments being made with the circular valve are not yet complete for publication.

John Stewart & Co., Limited, have several orders in hand, and the shops are full of repair work. It is a notable feature on the *Thames that the* engineering works and the dry docks do their work and make no display. In fact it is less than that, one would never imagine big work was done in the small places in which it is executed. Who would imagine when walking through the yards of John Stewart & Co., Limited, that they repaired the great steamers of the Orient Line? Who could think that it would be here the *Oroya* would come to get her new shaft weighing twenty-six tons. But these things are done in their quiet way, and nothing is said about it. There have been six barges fitted with chain gearing for elevating the coal over the ships' side. Some few of them have been on trial, and they have worked excellently, but there is another trial which they will undergo which may show more flaws than the scientific one. That trial is its competition with present methods, which brings in the factor of human nature, not quite so easily worked and put right as the engineering factors. This firm has at present an excellent system of electric drilling when the steamers are lying in dock. The mains run alongside the dock, and the attachment of the leads to drilling machines is a very simple matter. But the men did not think so, and they declined to work it at first. However, they are used to it now. There are three dry docks, the largest being 475 ft. long, and suitable for very large jobs. It is rather an old-fashioned firm, and does all its work within its own gates. It is therefore an excellent place for serving an apprenticeship. It has therefore its full complement of shops. The drawing office, the machine and fitting shop, the boiler shop, smiths' shop, copper pattern making, iron foundry shops, the brass foundry, joiners' and carpenters' shop, and the shipyard with all its shops and appurtenances. At present two barges are being built. In the shops a steamer, which has at present compound engines, with cylinders 26 in. and 49 in. by 36 in. stroke, are being tripled, and new boilers are being made for her of about 500 H.P. There is also a small set of compound engines being made with a boiler for a steamer abroad. The H.P. is about 50. In the fitting shop there are two overhead cranes which can deal with very large weights. One large lathe has a bed 40 ft. long, and, as said before, the *Oroya* shaft was turned in it. In the boiler shop there are large rollers for turning the plates to the desired radius, and a large hydraulic rivetter, also large drilling machines for making the holes for the rivets, and a hydraulic testing apparatus for testing everything to double the pressure. Two boilers are being constructed for a tug, and one for a steamer with engines of about 600 H.P., and draught 1,000 tons. In the smiths' shop there are two steam hammers; in the copper-smiths' shop brazing apparatus and testing apparatus for testing the pipes separately to double pressure. Any size of propeller is cast in the iron foundry, and they have cast them up to 11½ tons. In the repair work they are constantly requiring to re-end the blades, and very careful work it is. A steamer now running in the British India Company's system at Bombay was built here and engined and fitted out. The *Eclipse* also was engined.

Messrs. Fletcher, Son & Fearnall, Limited, have removed the lower dock, made some 70 years ago, to make a larger one of 440 ft. in length. Early in the New Year a new dock equipped on modern lines will be finished and ready to take its place in the Thames competition for orders. The width of the dock at the copings will be 79 ft., at entrance 60 ft., and depth 24 ft. The gates are of iron with chambers to render them buoyant. The pumping machinery is contained in a building 50 ft. by 28 ft., sunk 20 ft. below the level of the coping, and consists of two centrifugal pumps, with 26 in. suction pipes, and one centrifugal pump with 10 in. suction pump for draining purposes. The pumps will be driven by gas engines; the two large ones of 40 N.H.P., and indicating 137 H.P. The small one is 15 N.H.P. and 60 I.H.P. the pump well is a cast iron cylinder 10 ft. in diameter is sunk 53 ft. from the ground level, and the discharge pipe from the pumps 42 in. diameter. The dock will be pumped out in two hours without a ship in it. The other two docks will also be connected with them by means of culverts, so that all may be pumped with this machinery. A new boiler covering has just come out, and a company is being formed to work it. The covering consists of mica, and is the refuse sheets which are left after the best qualities are taken for the insulation of electric machine parts. It is extremely light and very efficient.

Messrs. Bell, Thompson & Co., 32, Irwell Chambers, East Fazakerley Street, Liverpool, have been appointed agents for their district by Messrs. Wilkinson & Co., Spring Gardens Works, Dudley.

BELFAST.

(From our own Correspondent.)

WE have very little of importance to record during the past month, as there has only been one launch from Messrs. Harland & Wolff's yard, that being the twin-screw steamer *Medic*, which took place on the 15th ult. She is a vessel of about 12,000 tons, and her dimensions are:—Length, 550 ft.; beam, 63 ft.; depth, 44 ft. The *Medic* is the thirteenth steamer belonging to the White Star Co. propelled by twin screws. In this connection, it might be interesting to note that the same company's steamer *Georgic*, built by the same firm, has since September 1897 made 13 round voyages across the Atlantic and has carried from New York to Liverpool 11,168 head of cattle without the loss of a single animal. The other vessels of the company have almost as good records, which speaks volumes for the arrangements made in these vessels for the transhipment of cattle by both builders and owners.

It will be seen from the tabulated reports of the tonnage launched throughout the kingdom, that the firm of Messrs. Harland & Wolff have put less tonnage in the water this year than they did during 1897. This is no doubt due to the fact that owing to the building of the great leviathan, the *Oceanic*, the building slips had to be rearranged, then extra space had to be allowed in the centre of the yard for the accommodation of so large a steamer, not to speak of the large extension which the firm have made to their works during the year. All these things tend to delay the construction of ships, hence the decrease of the output; but without a doubt, could the *Oceanic* be included in their output for 1898, Messrs. Harland & Wolff would undoubtedly head the list as in former years. We may mention that great preparations are in progress for the launching of this vessel. A grand stand is being erected on the Victoria Wharf, the use of which has been granted by the Belfast Harbour Commissioners, and a charge of 10s. per ticket is to be made for seats on this stand, the sum resulting therefrom to be handed over to the Belfast Royal Hospital, which is at present much in want of funds.

Messrs. Workman, Clark & Co., Limited, we believe intend to launch another steamer for the Ocean Steamship Co. during the last days of this month, but more details regarding the steamer will be given in our next issue. This firm has made the very large increase in their output for the year of 28,732 tons over their tonnage of 1897, which speaks well for this firm. They have also done a very large trade in repairs during the year, having a distinct and separate department for this class of work alone. They have a big shop close beside the Alexandria Graving Dock for ship repair work, then further up the Queen's Road they have the Abercorn Engine and Boiler Works, all throughly equipped for undertaking repairs of all kinds. We understand that the s.s. *Parisian*, of the Allan Line, Glasgow, will be sent here very shortly to have her engines tripled and fitted with a new set of boilers for high pressure steam, which are to be fitted with Deighton's patent furnaces.

We understand that a great scarcity of rivetters for ship work is being felt in the various yards here. The main cause of this is that the very large steamers which are being built here require so very heavy material in the shape of plates and rivets that men will not stay at the work if they can get employment elsewhere, and notwithstanding the extensive hydraulic rivetting plant which has been erected by Messrs. Harland & Wolff to cope with the extra strength of material required in the construction of the *Oceanic*, this is a serious matter, which will have to be faced in the near future.

We understand that the prospects for shipbuilding and engineering for the ensuing year are very bright, and that with the commencement of the New Year the shipbuilding yard at Londonderry will be re-opened under new management, where no doubt in these busy times they will be able to obtain plenty of orders for new work, as also a large quantity of repairs, for which this yard, which has plenty of cheap labour around the district, is splendidly situated.

The Channel Dry Docks Shipbuilding and Engineering Co., late the Queenstown and Passage Docks Co.—This shipbuilding and repairing yard has changed owners during the year. No ships have been built, but a large amount of repair work has been done.

The Spanish gunboat *Audaz* had her bow re-built in one of the dry docks just before the war with Spain and America commenced; the dismasted ship *Bothnia* was entirely re-masted and re-rigged; the twin-screw steam tug *Condor* was also fitted with new boilers; and the large passenger steamer *Xema*—which had been burnt out—was fitted for passenger service with the most modern arrangements.

A large set of shear legs have also been supplied to H.M. Devonport Dockyard.

The new firm has begun an extensive business in buying damaged vessels and repairing them to Lloyd's classification requirements, for re-sale, and has completed many vessels in this way, amongst them being the sailing ships *Morialta*, *Lord Wolseley*, *Bothnia*, *Jessie Stowe*, &c., and the steamers *Klondike*, *Condor*, *Vesta*, &c.

This extension of shipping industry in the south of Ireland by English capital, and the development of H.M.'s Haulbowline Dockyard by the Admiralty in Cork Harbour, marks a very satisfactory progress for the past year.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow—Great activity prevails in every branch of the shipbuilding and marine engineering trades of this district, and much progress has been made during the month in the work in hand. The s.s. *Clan Ferguson*, turret-decked steamer, built for the Clan Line, left Barrow on the 13th for the Clyde, on her maiden voyage. Her engines worked satisfactorily, and she reached Greenock after a good trial trip. She is the first turret-decked steamer that has been built at Barrow, although she is the sixth vessel the firm now have of this type. Her sister ship the *Clan Cumming*, will be launched at Barrow on the 26th of January next. These vessels are classed under the British Corporation. In the early part of the year the two British and African Co.'s steamers are making good progress. H.M.S. *Vengeance* is in a forward state, indeed much more forward than her sister ship *Irresistible*, launched this month at Chatham, but she will not be launched till the beginning of next year. In the meantime, H.M.S. *Amphitrite*, first-class cruiser, is gradually approaching completion. Her engines and boilers are all fixed and built up, and she will soon be ready for her dock trials. During the month, Messrs. Vickers, Sons & Maxim have tendered for the first-class cruiser required by the Admiralty, as well as for the four battleships which the Admiralty intend to give out to private builders. There is still a great demand for house accommodation at Barrow, and although about 300 houses are now in course of erection, an additional thousand houses are required to accommodate workmen's families, and others who will assuredly need them in the early future. With this object a scheme is on foot which is destined to furnish several hundred additional houses for workmen on Walney Island and elsewhere. H.M.S. *Niobe*, first-class cruiser, built at Barrow, was commissioned in the middle of December. The first official trial of H.M.S. *Bittern* at Chatham, in December, resulted in a very satisfactory run. Her mean speed on her three hours' run was about 30½ knots. The returns of shipbuilding for the year published from this district in last month's MARINE ENGINEER, were in error. It had been determined to launch the s.s. *Clan Cumming*, and Sir Wm. Wills steam yacht, this year, but these launches have now been deferred until January. This reduces the tonnage built by Messrs. Vickers, Sons, & Maxim this year to 24,079 tons, and the I.H.P. of the engines built to 35,700.

The details of the design of the new battleship for the Japanese Navy, to be built at Vickers' works at Barrow-in-Furness, have now been finally approved by the naval attaches here and by the authorities at Japan. She is to be 400 ft. long between perpendiculars, like the *Shikishima*, just launched, and the Clydebank ship, *Asahi*, to be launched early in the year, but she will be 76 ft. beam, which is the greatest beam for any ship. We cannot recall anything over 75 ft., and the draught will be 27 ft. 3 in., with a displacement of 15,000 tons. This is the limit for Japanese harbours. Our *Majestic* class draws 27 ft. 6 in., but the *Formidable's* have been made 26 ft. 9 in. the more easily to navigate the Suez Canal. The armament will consist entirely of Vickers' guns, which, as I previously pointed out, are more powerful than British weapons used hitherto. There will be four 12-in. guns, as in all our later ships, but these will be of 49 tons weight owing to their greater length, to give a higher striking energy, 40 ft. against 37 ft. As in the case of the Clydebank ship, there will be 14 6-in. quick-firers, discharging in all 11,200 lb. of shot per minute. The auxiliary armament will consist of 20 quick-firers, discharging 12 lb. projectiles at the rate of 20 per minute, so that all the guns will fire 400 per minute. There will be a large number of Maxim guns and four submerged tubes for discharging 18-in. torpedoes, so that in offence the ship will equal our best. The armour will extend right to the ram, and will vary from 9 in. to 4 in. in thickness of hardened steel, while the barbettes will have 14-in. to 10-in. steel. The protective deck will be 4 in. thick on the slopes and 2½ in. on the flat parts. The engines are to develop 15,000 I.H.P., to give a speed of 18 knots when running at normal piston speed. The details have not been worked out, but we we understand Belleville boilers will be used, 25 or 26 in all, and that they will be as liberal in their proportions as recent British battleship steam generators, while the working pressure will be the same, 300 lb. at the engines, and 250 lb. at the boilers. The twin engines will be of the triple-expansion type, with three cylinders, the diameters being 31 in. for the high pressure, 50 in. for the intermediate, and 82 in. for the low pressnre cylinder, with a stroke of 48 in., as against 51 in. in our recent battleships, but the same as in recent cruisers.

Seeing that the Furness Railway Co. is applying for Parliamentary powers to construct a new lock between the Ramsden Dock entrance basin and the Ramsden Dock proper, with the view of getting deeper water facilities for the larger class of ships now building for the Admiralty and private owners, and seeing there is a proposal to utilise this lock as a graving dock, it is interesting to note that a new naval dry dock is soon to be built by the United States Government at Boston, which will have the following dimensions:—Length, 750 ft.; width on floor, 80 ft.; wioth at top, 114 ft.; depth, of floor, 40 ft.; depth on all, 30 ft. Probably these dimensions would be about the right thing for the new dock at Barrow, with perhaps the exception of length and width of entrance. Seeing they are being built nowadays 800 ft. long and 80 ft. beam, it is desirable that any graving dock built to accommodate them should be, say, 850 ft. long, and certainly 100 ft. broad. With a dock like this Barrow would be able to take in not only the *Powerful* class, but such ships as the *Oceanic* and the promised *Gigantic*. At Glasgow, on the Tyne, and elsewhere, movements are being made to provide large dry docks, and it is essential to the life of Barrow trade a similar scheme should be adopted here. It is therefore satisfactory to find that the Furness Railway Co. is moving in this matter, and that the requisite powers will be asked for in Parliament during next session.

West Cumberland.—The shipbuilding trade is busily employed at Workington and Maryport, and makers are well off for work in the immediate future. During the month Messrs. Williamson & Son launched a screw steamer for Messrs. John Edwards & Co., Liverpool. She is built to carry 520 tons, and is classed A1 at Lloyd's. Her dimensions are:—Length, 152 ft. 3 in.; breadth, 23 ft. 6 in.; depth moulded, 12 ft. 3 in. She was named the *Rock Channel* by Mrs. Edwards. It is stated on reliable information at Workington, that Lord Lonsdale intends to dredge Workington harbour and the channel of the river, in order to provide accommodation for some of the largest vessels which bring cargoes of ore to the port. Vessels of greater draught are now mooring by the harbour side than has ever been previously experienced. Nothing further has been heard lately of the proposed new dock as Maryport, which to some extent is opposed to the Workington dock scheme.

The tonnage launched at Maryport, by Messrs. Ritson & Co., is 538, in contrast with 1,860 tons for 1897, two small steamers being built, whilst a year ago, one large sailing ship was built. At the neighbouring port of Workington there have been this year 2,512 tons shipping built in Messrs. R. Williamson & Son's yard, against 3,452 tons last year.

Personal.—Mr. Wm. Johnston, for many years Lloyd's shipbuilding surveyor for the West Coast of England, has been promoted to a better position at Sunderland, and Mr. Sharp, of Sunderland, has been promoted to Mr. Johnston's position at Barrow.

Steel Shipbuilding Material.—The demand for steel shipbuilding material has further increased, and makers are being urgently pressed for deliveries on existing contracts. The plate mills have all been busily employed, and makers have orders in hand for a considerable time to come. As prospects are so good efforts are being made to increase the production of plates by increasing the number and capacity of the Siemens-Martin furnaces, and the provision of new cogging mills, so as to feed the plate mills more regularly than is possible at present. Prices have further advanced, and heavy plates of usual specification are now quoted at £6 17s. per ton. There is a growing trade in heavy steel castings, and makers are increasing the size and capabilities of their foundries.

The Hematite Trade.—A brisk tone characterises the hematite pig-iron trade. Orders are very largely held, and makers are so fully sold forward that they have little or no more to sell at present. This fact consequently places the market in the hands of speculators, who have been negotiating by deals in warrant iron, with the result that in the second week of October stocks increased 33,565 tons, although the actual make of the furnaces is not more than 25,000 tons, and quite half of that production was needed by steel makers. This is a paradox which needs explanation. Prices are steady at about 57s. per ton.

Shipping.—Briskness is still observable in the shipping trade, and the exports of pig iron up to date this year, shows pig-iron with a total of 496,472 tons of steel, with 494,085 tons, as compared with 416,179 tons of pig-iron in the corresponding period of last year, and 443,044 tons of steel. This makes an increase of 80,293 tons of pig-iron, and 51,041 tons of steel.

Miscellaneous.

Cyclops Cement.—This cement is being introduced, after long and continued experiments, as one which is of the greatest advantage to engineers and steam users. For stopping leaks in high-pressure boilers it is laid on the inside of the shell, in the water space, covering seams and rivet heads, and will not crack or lift from iron or steel plating, as it expands and contracts with the plates. It is being used in new boilers, and also in locomotive boilers, with what one firm describes as "splendid results." For making steam joints it is giving satisfaction. As a fire-proof cement it is unequalled—it will stand the excessive heat produced by forced draught, regenerative furnaces, &c., and it is being used with much success in steamships in the combustion chambers, covering rivet heads, building bridges, covering arches, and preserving back end plates, stay nuts, &c., from being burned away. As a hydraulic cement it is being used for such purposes as stopping holes in water tanks, ballast tanks, cementing and filling up holes in stern tubes, filling up pittings, old ships' bottoms, propeller blades, and protecting nut and boss, &c., &c. In the latter connection we may mention that the propeller blades of the s.s. *Lucania* were treated with this cement previous to her making her record trips. Cyclops Cement has a natural affinity for adhering to iron and steel plating, and there is nothing whatever in its composition which can cause injury of any kind or set up any galvanic action, as is the case with some cements. Marine engineers, locomotive engineers, and all steam users would do well to give it a trial, as from the reports and testimonials we have seen there can be no question that it is a very superior cement. It will not deteriorate by keeping, and being in a handy form is always ready for use. The manufacturers are Messrs. R. & I. Rankin, 22, Manchester Street, Liverpool, who have other important specialties for steam users.

Messrs. W. Dobson & Co.—The Russian Government, encouraged with the success which this firm have had in conveying vessels in separate parts from Newcastle-on-Tyne to the Caspian Sea, afterwards fitting them together, are making a similar attempt with small war craft intended for the Far East until the shipbuilding works in course of construction at Port Arthur aud Vladivostock are in a position to supply the necessary additional strength to Russia's naval power in Eastern waters.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Balmyle.—On November 12th there was launched at Maryport for Messrs. W. Kinnear & Co., of Dundee, a steel steamer of about 374 tons gross, named the *Balmyle*.

Doreen.—On November 14th there was launched at South Shields, for the Wear Steam Fishing Co., Sunderland, a steel steamer of about 120 tons gross, named the *Doreen*.

Arkansas.—On November 15th there was launched at North Shields, for Grimsby owners, an iron steam ketch of about 180 tons gross, named the *Arkansas*.

Osiris.—On November 16th there was launched at Hull, for Messrs. Roberts & Ruthwen, Limited, of Grimsby, an iron steam ketch of about 170 tons gross, named the *Osiris*.

Forest Castle.—On November 17th an important addition was made to the Forest Oak Steam Shipping Co.'s fleet when Messrs. W. Doxford & Sons launched at Pallion, Sunderland, one of the largest turret steamers they have yet constructed. She has a deadweight cargo-carrying capacity of 4,750 tons, is a vessel 300 ft. in length, with a beam of 43 ft., and is built for drawing but 21 ft. of water when fully loaded. She is to be engined by her builders, and is intended to attain a speed of 10 knots. The ceremony of naming the vessel *Forest Castle* was entrusted to Mrs. Weidner, the wife of Mr. J. F. Weidner (chairman of the Forest Oak Co.).

Corby Castle.—On Saturday, November 26th, Messrs. Wm. Pickersgill & Sons, Southwick, launched from their yard a fine steel screw cargo steamer of the spar-deck type, built to the order of Messrs. James Chambers & Co., of Liverpool, this being the sixth vessel built by the firm for the same owners. The dimensions of the vessel are as follows:—Length, 360 ft.; breadth, 46 ft. 3 in.; depth, 28 ft. 2 in., and she has been built under Lloyd's special survey for the 100 A1 class. The hull is built on the deep frame principle and fitted with water ballast throughout in cellular double bottom and after peak. The scantlings of the vessel have been materially increased to enable her to claim what is practically a three decked freeboard, which will allow of her carrying a deadweight cargo of about 5,900 tons, on a moderate draught. The vessel will be rigged as a two-masted fore-and-aft schooner, with steel lower masts, and wood telescopic topmasts, and she is to be fitted with seven large steam winches, quick warping steam windlass, and steam steering gear, which is fitted in a house abaft engine casing, led direct to large double cast steel quadrant, fitted on rudder-head, and controlled from bridge by means of rods and bevelled wheels. With a view to rapid loading and discharging of cargo, the vessel is provided with five large hatchways, each worked by extra strong double derricks. Two large derrick posts being fitted amidships for working after end of main hold, and she is to be thoroughly equipped with all the latest appliances of a first-class modern cargo steamer. A large steel deckhouse is fitted on bridge-deck for the accommodation of the captain and officers, while the engineers are also berthed in steel houses at sides of engine casing on bridge-deck. Rooms for petty officers and apprentices are fitted on spar deck at after end of bridge, and the crew is comfortably provided for under the topgallant forecastle. The engines and boilers are to be fitted by Messrs. George Clark, Limited, the engines being of the triple-expansion type, having cylinders 23½ in., by 40 in., by 66 in., and a stroke of 45 in., steam being supplied by three large steel boilers, working at a pressure of 180 lbs., and fitted with Howden's forced draught. The vessel throughout will be fitted with electric light supplied by Messrs. Holmes & Co., of Newcastle-on-Tyne. During construction the vessel and engines have been under the personal superintendence of Mr. E. H. Bushall, consulting engineer of Liverpool, and she will be commanded by Captain Valentine, who will also overlook the fitting out of the vessel. On leaving the ways the vessel was named *Corby Castle* by Mrs. Walter Chambers, of Liverpool.

Norseman.—On November 26th there was launched by Messrs. Cochrane & Cooper, Limited, from their Grovehill Shipyard, Beverley, the steam trawler *Norseman*, built to the order of the Metropolitan Steam Fishing Co., Limited, Grimsby. Her dimensions are:—110 ft. by 21 ft. by 11 ft. 3 in., and will be supplied with triple-expansion engines by Messrs. Bailey & Leetham, Hull. The launching ceremony was performed by Miss Rose Hardy.

H.M.S. Bramble.—On November 26th Messrs. W. H. Potter & Sons launched at Queen's Dock, Liverpool, a shallow-draught, twin-screw, teak-sheathed steel gunboat, which has been built to the order of the British Government. The dimensions of the vessel are as follows:—Length between perpendiculars, 180 ft.; length over all, 187 ft. 5 in.; beam extreme, over wood sheathing, 33 ft. At her loaded draught of 8 ft. she will have a displacement of 710 tons. The propelling machinery consists of two triple-expansion, three-crank engines, and two Yarrow water-tube boilers. The vessel, which was named *Bramble*, is one of four of the *Thistle* class, two being built by Messrs. Potter, the other two on the Clyde.

Chatton.—On November 26th there was launched by Messrs. John Readhead & Sons, West Docks, South Shields, a steel screw steamer, to the order of Messrs. Steel, Young & Co., London, of the following dimensions:—Length over all, 353 ft.; breadth, 46 ft. 6 in.; and depth moulded, 27 ft. 4 in. She has been built under special survey, is classed 100 A1 at Lloyd's, and has a deadweight carrying capacity of about 5,850 tons on a light draught. The steamer will be fitted with triple-expansion engines, also constructed by Messrs. John Readhead & Sons, having cylinders 24 in., 40 in., and 65 in. by 45 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel was named *Chatton* by Mrs. Wm. Young, wife of the managing owner.

Thor. — On November 26th Messrs. Edwards Brothers launched at North Shields a new steam trawler for Messrs. The Islandsk Handels and Fiskerikompagni Aktieselskab, Copenhagen, of the following dimensions:—115 ft. by 21 ft. 6 in. by 12 ft., having triple-expansion engines constructed by Mr. G. T. Grey, South Shields, with cylinders 12¼ in., 19½ in. and 32 in. in diameter by 22½ in. stroke, and fitted with all latest improvements for the Icelandic fishing. The christening ceremony was performed by Mrs. Solling, wife of Captain Solling, Danish Fishery Inspector, who named the vessel *Thor*.

Fawn.—On November 26th there was launched at Hull, for Messrs. Fisher, Morris & Co., Grimsby, an iron ketch-rigged steamer of about 170 tons gross, named the *Fawn*.

Zittella.—Lately, Mr. Henry Scarr launched at Hessle, to the order of Captain Herbert Sutton, of Thorne, a keel of the following dimensions:—Length, 61 ft. 6 in.; depth, 8 ft. 4 in.; and beam, 15 ft. 6 in. The vessel was named the *Zittella*.

Revesby.—Lately Messrs. John Jones & Sons launched at Brunswick Dock, Liverpool, the steam trawler *Revesby*, the first of two iron steam trawlers being built to the order of the Boston Deep-sea Fishing and Ice Co., Limited. Her dimensions are 110 ft. by 21 ft. by 11 ft. hold, and she has been built under Lloyd's special survey to class 100 A1. The engines are of the triple-expansion type, and are designed to work at a pressure of 200 lbs. per square inch.

Cynthia.—Lately there was launched at Sunderland for Messrs. R. Nicholson & Sons, of Liverpool, a steel schooner-rigged steamer of about 3,065 tons gross, named the *Cynthia*.

Carrington.—Lately, Messrs. John Jones & Sons launched from their shipbuilding yard, Brunswick Dock, Liverpool, to the order of the Boston Deep Sea Fishing and Ice Co., Limited, the iron steam trawler *Carrington*. Her dimensions are 110 ft. by 21 ft., and 11 ft. hold. She is fitted with triple-expansion engines and large multitubular boiler for a speed of 11 knots.

Folmina.—Lately, a fine steel screw steamer was launched from the shipbuilding yard of Messrs. John Priestman & Co., Southwick, of the following dimensions:—Length, 351 ft.; breadth, 48 ft.; depth, 29 ft. 3 in. She will be classed 100 A1 in Lloyd's Registry, and is of the strengthened spar-deck type. The engines and boilers have been built at the works of Messrs. Wm. Allan & Co., Limited, Sunderland. The engines are of the triple-expansion type, having cylinders 25 in., 41 in., and 67 in., with a 45 in. stroke. Two large boilers will supply steam at a pressure of 160 lbs. per square inch. She was purchased by Sir Christopher Furness, West Hartlepool, and subsequently sold to Mr. Jos. de Poorter, of Rotterdam. The vessel on leaving the ways was named *Folmina*, the christening ceremony being performed by Mrs. John Priestman.

Aker.—On November 28th Messrs. Ropner & Son, Stockton-on-Tees, launched a steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 325 ft.; breadth, extreme, 48 ft.; depth, moulded, 24 ft. 3 in. The steamer has been built to the order of Sir Chr. Furness, West Hartlepool, for Messrs. Fearnley & Eger, of Christiania, and is of the three decked rule, with one deck laid, having full poop, long bridge, and topgallant forecastle. The saloon and cabins for captain and officers will be fitted in the poop, the accommodation for engineers is arranged in iron houses on the bridge deck amidships, and the crew will be berthed in the forecastle, as usual. She has double bottom on the cellular principle for water ballast, and will carry about 5,000 tons deadweight on Lloyd's freeboard, on a light draught of water. She will have direct steam windlass, steam steering gear amidships, with powerful screw gear aft, five large steam winches, a horizontal multitubular donkey boiler, stockless anchors, etc. She will be fitted with a set of triple-expansion engines, by Messrs. Sir Chr. Furness, Westgarth & Co., Limited, having cylinders 24 in., 38 in., and 64 in. by 42 in. stroke, two steel boilers 15 ft. 3 in. by 10 ft. 3 in., at 160 lbs. working pressure. As the steamer left the ways, Miss Ropner, daughter of Colonel Ropner, gave her the name of *Aker*.

Greenhill.—On Tuesday, November 29th, Messrs. Craig, Taylor & Co. launched from their Thornaby Shipbuilding Yard, Thornaby-on-Tees, a handsomely-modelled steel screw steamer of the single-deck type, and of the following dimensions:—278 ft. by 40 ft. 8 in. by 20 ft. 6 in. moulded. She is built of steel to the highest class in Lloyd's, and has poop, bridge, and topgallant forecastle, also water-ballast fore and aft on the double cellular principle. The vessel has deep frames, thus giving her clear holds for stowing cargo. She has very large hatches, and has been constructed to carry a deadweight of over 3,000 tons on a light draught of water. She will be equipped with four large steam winches, patent steam-steering gear, patent steam windlass, large Meredith donkey boiler, screw gear aft, telescopic masts to Manchester Canal requirements, and all the latest improvements. Her propelling machinery has been constructed by Messrs. MacColl & Pollock, of the Wreath Quay Engine Works, Sunderland, the cylinders being 21 in., 34 in., 56 in., by 39 in. stroke, and two large boilers working at 160 lbs. pressure. The vessel has been built to the order of Messrs. W. J. Tillett & Co., Cardiff, the hull and outfit being under the superintendence of Captain Tom, and the machinery under that of Messrs. Powell & Richards. As the vessel left the ways she was gracefully christened the *Greenhill* by Miss Maggie Craig, daughter of one of the builders.

Silesia.—On Tuesday, November 29th. Messrs. Wigham Richardson & Co. launched a fine steel screw steamer which they are building to the order of the Austrian Lloyd's Steam Navigation Co., of Trieste. The steamer is 400 ft. in length by 49 ft. beam, and is being built to attain the highest classes in the Registers of the English Lloyd and the Austro-Hungarian Veritas. The propelling machinery and boilers are also being constructed by Messrs. Wigham Richardson & Co. The former consist of a set of quadruple-expansion engines, balanced on the Yarrow Schlick & Tweedy system, and the whole are designed to drive the vessel at a high speed. The steamer will have accommodation for 20 passengers. She will also be well supplied with all the latest and most improved appliances for working both the ship and the cargo. The owners were represented at the launch by Mr. Vecchi, their resident superintendent engineer. As the vessel left the ways she was named the *Silesia*, the christening ceremony being gracefully performed by Miss M. Gregory White, of Bournemouth.

Hermes.—On November 29th Messrs. J. Blumer & Co. launched at Sunderland a new steamer of the spar-deck type, specially designed to carry cattle, for Messrs. R. P. Houston & Co.'s River Plate Line. She takes the highest class at Lloyd's. Length over all, 365 feet; breadth, 47 ft.; depth, moulded, 27 ft. 6 in. A special feature is the length of the various erections, with portable decks between, making her flush fore and aft. She has been built on the deep-frame system. The engines and boilers have been built by Messrs. John Dickinson & Sons, Limited, and are of the triple-expansion type, the cylinders being 26 in., 43½ in., and 72½ in. by 48 in. stroke, with large boilers 15 by 12 ft., working pressure 180 lbs. The vessel was named *Hermes*.

Thyra.—On November 29th there was launched by Messrs. Osbourne, Graham & Co., at Hylton, a steel spar-deck steamer, built to the order of Mr. W. Wilhelmsen, of Tonsberg, Norway. The principal dimensions are 351 ft. by 48 ft. by 29 ft., and she is designed to carry 6,000 tons on 23¼ ft. The vessel is classed 100 A1 at Lloyd's and also 1 A1 at Det Norske Veritas. The main engines have cylinders of 24 in., 40 in., and 66 in. by 45 in. stroke, and are to be supplied by Messrs. Blair & Co. As the vessel left the ways she was named the *Thyra* by Mrs. Edwardson, of Tonsberg.

Ville de Tamatave.—On November 30th there was launched at Sunderland, for the Compagnie Havraise Pen de Nav. a Vap., of Havre, a steel schooner-rigged steamer of about 3,401 tons gross, named the *Ville de Tamatave*.

Pavonia.—On December 1st there was launched by Messrs. Cochrane & Cooper, Limited, from their Grovehill Shipyard, Beverley, the *Pavonia*, built to the order of Messrs. E. J. Williams & Co., Limited, Hull, and is of the following dimensions—115 ft. by 21 ft. by 11 ft. 3 in. Messrs. J. Cran & Co. are supplying engines of the triple-expansion type. The vessel was named by Mrs. Collinson, of Hull.

Clarence.—On Monday, December 12th, Sir Raylton Dixon & Co., Limited, launched from their Cleveland Dockyards, Middlesbrough, a handsomely-modelled twin-screw mail and passenger steamer, built for Messrs. Elder, Dempster & Co., of Liverpool. Her principal dimensions are, 382 ft. by 46 ft. by 25 ft. moulded. Accommodation will be provided for 108 first-class and 50 second-class passengers, in most spacious and handsomely fitted cabins, with large dining-room panelled in marble and inlaid wood in house on deck. The first-class smoking-room, second-class smoking-room, and cabin entrances will be elaborately fitted and decorated, and the vessel will be lighted throughout with electric light. A powerful refrigerating machine with large cooling chambers will also be provided for the conveyance of fresh meat, provisions, &c. Twin-screw triple-expansion engines will be fitted by Messrs. The Wallsend Slipway & Engineering Co., Limited, Newcastle-on-Tyne, having cylinders 21½ in., 35 in., 59 in. by 42 in. stroke, supplied with steam by four large single-ended boilers working at 180 lbs. pressure and fitted with Howden's system of forced draught. On leaving the ways she was gracefully named *Clarence* by Miss Johnson.

Daghistan.—On Tuesday, December 13th, Messrs. Wm. Gray & Co., Limited, launched the steel screw steamer *Daghistan*. She is of the following dimensions, viz.:—Length, over all, 285 ft.; breadth, 41 ft. 6 in.; depth, 20 ft. 2 in., and has been built to the order of Messrs. Frank C. Strick & Co., Limited, Swansea and London, to Lloyd's highest class. Her deck erections consist of poop, raised quarter-deck, bridge, and topgallant forecastle. The saloon and accommodation for captain and officers will be fitted in the poop, the engineers' berths amidships, and the crew's quarters forward. The vessel is built with bulb angle frames, cellular double bottom and after-peak ballast tanks, steam winches, patent donkey boiler, steam steering gear amidships, screw gear aft, steam windlass, schooner rig with telescoping masts, boats on beams overhead, &c. The engines are of the triple-expansion type, working on three cranks. They are supplied by the Central Marine Engineering Works of William Gray & Co., Limited. The cylinders are 21½ in., 34 in., and 57 in. diameter, and the piston stroke 39 in., and two steel boilers to work at a pressure of 160 lbs. per square inch. The vessel has been built under the superintendence of Mr. Archibald Walker on behalf of the owners, and the ceremony of naming her *Daghistan* was gracefully performed by Miss Bland, of Mansfield House, West Hartlepool.

Monteagle.—On December 13th there was launched from the Jarrow Yard of Messrs. Palmers' Shipbuilding & Iron Co., Limited, a finely modelled steel twin-screw steamer, of the following dimensions:—Length, between perpendiculars, 445 ft.; breadth, extreme, 52 ft.; depth, moulded, 30 ft. 10 in. The vessel is rigged as a four-masted fore and aft schooner, and has been built under special survey, to take the highest class in Lloyd's registry. She is of the three-decked type, with two steel decks laid all fore and aft, and has an iron shelter deck specially strengthened for the Atlantic trade, extending over the whole length, and above this is a shade deck, covering the machinery openings. All the available space under the shelter deck, and along each side under the shade deck, is fitted throughout with the most improved and modern arrangements for carrying cattle. Accommodation for the officers and engineers is arranged on the shade deck in large steel houses, and for the seamen, firemen and cattlemen forward. A cellular double bottom is fitted all fore and aft and is arranged for carrying water ballast and also for fresh water for supplying cattle. Water ballast is arranged to be carried in a deep cargo tank and in the after peak, giving the vessel a total water ballast capacity of over 2,000 tons. She is designed to carry about 8,000 tons deadweight, on a mean draught of 25 ft. The vessel is divided into eight watertight compartments by means of seven steel bulkheads, all of which extend to the upper deck. Each cargo compartment is fitted with a complete set of grain division boards, extra large cowl ventilators, and all other requirements for the safe carriage of grain or other cargoes, and a complete system of hatches, winches and derricks are provided for the rapid loading and discharging of cargoes. Aft of the engine-room the 'tween decks are insulated and fitted with the necessary refrigerating plant for carrying about 500 tons of cargo. A powerful steam windlass is fitted forward for working the cables, and a combined hand and steam screw steering gear of special design is fitted in a large steel wheelhouse on the aft end of the shelter deck. The vessel is lighted throughout by electricity, and will be fitted and finished as a first-class cattle and cargo steamer, including all the most modern improvements for the Atlantic trade. The engines, which are twin-screw, are also being constructed by the Palmer Co. They are of the inverted vertical triple-expansion type, each set having cylinders 26 in., 43 in., 70 in. by 45 in. stroke, steam being supplied by three double-ended boilers 14 ft. 6 in. diameter by 17 ft. 6 in. long, with a working pressure of 180 lbs. As the vessel left the ways she was gracefully christened *Monteagle* by Mrs. Dugdale, wife of the shipyard manager. The company afterwards adjourned to the offices for refreshments, where the usual congratulatory toasts were honoured. The *Monteagle*, which has been built to the order of Messrs. Elder, Dempster & Co., of Liverpool, is the third of six steamers ordered from the Palmer Co. for the same owners.

Rock Channel.—On Tuesday, December 13th, there was launched from the yard of Messrs. R. Williamson & Son, Workington, a finely-modelled screw steamer, built to the highest class at Lloyd's, for Messrs. J. Edwards & Co., Liverpool. Her dimensions are:—Length, between perpendiculars, 152 ft. 3 in.; breadth, 23 ft. 6 in.; depth, moulded, 12 ft. 3 in., and designed to carry 520 tons on Lloyd's freeboard. The engines are to be supplied by Messrs. Ross & Duncan, of Govan, and are of the compound type, having two cylinders 19 in. and 38 in., with a stroke of 27 in. As she left the ways she was gracefully named *Rock Channel* by Mrs. Edwards.

Bergenhus.—On December 14th Messrs. Irvine's Shipbuilding and Dry Docks Co., Limited, launched a beautifully-modelled steel screw steamer of 6,000 tons deadweight carrying capacity on Lloyd's Summer Freeboard. The vessel has been built to the order of Captain Andreas Olsen, of Bergen, Norway, and is built to Lloyd's highest class under special survey, and is also classed with the Norwegian Veritas. She is of the following dimensions:—352 ft. by 48 ft. by 27 ft. 9 in., having poop, long bridge, and topgallant forecastle for the housing of the crew; cellular double-bottom for water ballast all fore and aft. The accommodation for captain, officers and engineers, is provided for on bridge, the former immediately under the navigating bridge and the latter alongside the engine casing and cabins arranged in the latest fashion to conduce to the comfort of the officers. Special regard has been paid for dealing with rapid loading and discharging of cargoes, for which extra large hatchways have been fitted with powerful winches of the company's own make, and double derricks to each hatch, together with all the latest improvements in the entire outfit of the vessel, including steam-steering gear, and the latest improved steam windlass, &c The boats will be placed on a platform deck overhead. The engines are of the triple-expansion type, and will be supplied by the Central Marine Engine Works, West Hartlepool, and are of the following dimensions: 25 in., 40 in., and 66 in. by 45 in., steam being supplied by two large S.E. boilers working at a pressure of 160 lbs. As the vessel left the ways the christening ceremony was gracefully performed by Mrs. Bodin, of Sunderland, who named the ship *Bergenhus*. The hull and machinery have been built under the special supervision of Mr. Lauritz M. Bodin, the owner's superintendent.

Barges.—On December 14th and 15th there was launched om the yard of Mr. Joseph Scarr, Grove Hill, Beverley, two barges of the following dimensions:—Length, over all, 68 ft. 6 in.; breadth, extreme, 13 ft. 2 in.; depth, moulded, 5 ft. 2 in.; and with a carrying capacity of 70 tons. The vessels were built to the order of Messrs. Cory & Sons, London, and are the first of an order for six.

Fremington.—On December 14th Messrs. Robert Thompson & Sons launched sideways, from the Bridge Dockyard, Sunderland, a steel screw steamer of the following dimensions:—Length, b.p., 136 ft.; breadth, 23 ft.; depth, moulded, 11 ft. 2 in. Her engines, with cylinders 16½ in. and 37 in. by 24-in. stroke, are by Hedley & Boyd, North Shields. The vessel has been built to the order of the Liverpool and North Devon Steamship Co., Limited, Liverpool, under the inspection of Mr. E. H. Bushel, of Liverpool, and is classed 100 A1 at Lloyd's. As the vessel left the ways she was christened *Fremington* by Mrs. J. K. Morril, wife of the managing owner.

Hendon.—On December 14th Messrs. S. P. Austin & Son, Limited, launched at Sunderland the steel screw steamer *Hendon*, which has been constructed to the order of Messrs. Wm. Cory & Son, Limited, of London, for their extensive coal trade. The vessel's dimensions are:—Length, 264 ft.; breadth, 39 ft. 3 in.; moulded depth, 19 ft. 5 in. She will be classed 100 A1 in Lloyd's Register, the deadweight carrying capacity being about 2,600 tons. The machinery, to be supplied by Messrs. Wm. Allan & Co., Limited, of Sunderland, will be of the tri-compound type, with ample boiler power

Claverdale.—On Thursday, December 15th, Messrs. Craig, Taylor & Co. launched from their Thornaby Shipbuilding Yard, Thornaby-on-Tees, a handsomely-modelled spar-decked screw steamer of the following dimensions—341 ft. by 45 ft. by 28 ft. 6 in. depth moulded. She is built of steel to the highest class in Lloyd's, with poop, bridge, and topgallant forecastle, water ballast in double cellular-bottom fore and aft, ballast also in peaks. The vessel has been built on the deep frame principle, giving her clear holds for stowing cargo. She has large hatches, and is rigged as a fore and aft schooner. She will carry a deadweight of about 5,500 tons on a light draught of water, and be fitted with six large steam winches, patent steam-steering gear, patent steam windlass, large multitubular donkey boiler, screw gear aft, and all modern improvements. Her engines have been constructed by Messrs. Thomas Richardson & Sons, Limited, Hartlepool, the cylinders being 24 in., 38 in., 64 in. by 42 in. stroke, with two large boilers 160 lbs. working pressure. The vessel has been built to the order of Messrs. E. H. Haslehust & Co., London, for their Cape trade, the hull and outfit being under the superintendence of Captain John Barker, and the machinery under that of Messrs. Jacobs & Barringer. The christening ceremony was gracefully performed by Miss Barker, daughter of Captain Barker.

Brookwood.—On December 16th Messrs. R. Craggs & Sons launched at Middlesbro' a steel screw steamer, built to the order of Sir Christopher Furness for Messrs. Constantine, Pickering & Co., of Middlesbro'. Her dimensions are—300 ft. between perpendiculars. 43 ft. extreme breadth, and 23 ft. moulded depth. She is built to pass Lloyd's 100 A1 class under the "two-deck" rule, with one deck laid, and will be fitted with triple-expansion engines of the latest improved type by Messrs. Sir C. Furness, Westgarth & Co., Limited, of Middlesbro, having cylinders 22½ in., 36½ in., and 61 in. in diameter by 42 in. stroke, steam being supplied by two extra large single-ended boilers, working at 160 lbs. per square inch. The vessel was named *Brookwood*.

Benbow.—On December 17th Messrs. Cochrane & Cooper launched from their Grovehill Shipyard, Beverley, a steam trawler of the following dimensions:—100 ft. by 21 ft. by 11 ft. depth of hold, built to the order of Mr. W. Grant, Grimsby. Engines of triple-expansion type will be fitted by Messrs. C. D. Holmes & Co., Hull, and the vessel will be complete with the latest appliances for trawling. Miss Alice Grant named the vessel the *Benbow*.

LAUNCHES.—SCOTCH.

Holland IV.—On November 17th Messrs. Duthie, Sons & Co., launched at Aberdeen for Amsterdam owners the steam trawler *Holland IV.*, a vessel of 170 tons gross.

Anholt.—On November 18th there was launched at Renfrew for the United Steamship Co., of Copenhagen, a steel steam tug of about 110 tons gross, named the *Anholt*.

Pharsalia.—On November 24th Messrs. Russell & Co., launched at Port-Glasgow a steel screw steamer named *Pharsalia*, for Messrs. William Thomson & Co., St. John's, New Brunswick. The vessel measures:—Length, 340 ft.; breadth, 46 ft.; depth, 28 ft. moulded. The vessel registers 2,280 tons net, 3,500 tons gross, and will carry 5,800 tons deadweight. Messrs. Blackwood & Gordon, Port-Glasgow, will supply triple-expansion engines.

Clonlee.—On November 29th there was launched by the Ailsa Shipbuilding Co., at Troon, a steel screw steamer, built to the highest class at Lloyd's for Irish owners, and to carry about 1,050 tons. The engines are being fitted by Messrs. Muir & Houston, Limited, of Kinning Park Works, Glasgow, and are of the triple-expansion type. The vessel was named *Clonlee*, and is a sister ship to the *Raloo*, recently launched for the same owners.

Rob Roy.—On November 29th Messrs. Hawthorns & Co., Limited, launched at Leith a screw steam trawler, built to the order of Messrs. Ellis & Spence, of Grimsby. The vessel was christened *Rob Roy*.

Onslow.—On November 30th there was launched from the shipbuilding yard of Messrs. Barclay, Curle & Co. Limited, a steel screw-steamer built to the order of Messrs. Harris & Dixon, of London, and intended for their Black Sea and Mediterranean trade. The vessel is specially designed for carrying large cargoes of grain in bulk, and is classed 100 A1 at Lloyd's. The general features of the design have been adopted by the owners after long experience of this particular trade, there being no 'tween deck nor hold beams in the vessel. The hatches are large, and arranged to suit the latest requirements of the Grain Act. The masts are telescopic, and the deck machinery is of the most modern and approved type for the rapid discharging and loading of cargo. The deck erections consist of poop, bridge, and forecastle, with ample accommodation for officers and crew. Her dimensions are:—312 ft. by 46 ft. by 23 ft., with a gross tonnage of 2680. The vessel was named *Onslow* by Miss Dodd, daughter of Mr. T. J. Dodd, principal surveyor of Lloyd's Register, Glasgow. After the launch the steamer was towed to the harbour to be fitted by the builders with her machinery, which is of the triple-expansion type, cylinders 22½ in., 37½ in., 62 in. by 3 ft. 6 in. stroke, and two steel boilers capable of developing a large horse-power.

Corundum.—On November 30th, Messrs. Scott & Sons launched from their shipbuilding yard at Bowling a screw steamer of the following dimensions, viz.:—230 ft. by 35 ft. by 16 ft., which they have built to the order of Mr. William Robertson, of Glasgow, for his Gem Line. Triple-expansion engines will be fitted on board by Messrs. Muir & Houston, Kinning Park, Glasgow. On moving down the ways the steamer was named *Corundum* by Miss Wallace, View Park, Crow Road, Partick. This is by far the largest vessel, both in size and tonnage, ever built at Bowling, the launch being conducted with great success.

Collegian.—On November 30th Messrs. Charles Connell & Co., launched from their yard at Scotstoun, Whiteinch, the steel screw-steamer *Collegian*, which they have built to the order of Messrs. Thomas & James Harrison, Liverpool. Her dimensions are:—470 ft. by 56 ft. by 34 ft. 10 in., with a gross tonnage of about 7,200 tons. After the launch she was towed to Prince's Dock to have her machinery fitted on board, which is being supplied by Messrs. Dunsmuir & Jackson, Govan.

Laesp.—On November 30th there was launched at Renfrew for the United Steamship Co., of Copenhagen, a steel steam-tug of about 110 tons gross, named the *Laesp*.

Kosai Maru.—Lately Messrs. Lobnitz & Co., Limited, Renfrew, launched the steel screw steamer *Kosai Maru*, for the Red Cross Society of Japan. The vessel is 2,550 tons gross, and will be furnished by the builders with triple-expansion engines.

Sirdar.—Lately there was launched by Messrs. Alexander Hall & Co., at Aberdeen, the largest trawler that has yet been built there. Her dimensions are:—Length over all, 125 ft.; breadth, 21 ft. 3 in.; moulded depth, 12 ft. 3 in.; gross tonnage, *198 tons*. She will be fitted by the builders with triple expansion engines of 450 I.H.P. The vessel has been built to the order of Messrs. Pickering, Haldane & Co., Limited, Hull, and was christened the *Sirdar*.

Equerry, Eagle, and Erith.—On December 2nd Messrs. Mackie & Thomson, launched at Govan three steam trawlers of 160 tons each, which they have built to the order of the Great Northern Steamship Fishing Co., Limited, Hull. The order of which they are part was for fifteen. Messrs. Muir & Houston are supplying the engines. They were named the *Equerry* by Mrs. Ashdown, Toronto; the *Eagle* by Mrs. M'Iver, Edinburgh; and the *Erith* by Mrs. Lamb, Helensburgh.

Asia.—On December 3rd, Messrs. William Hamilton & Co. launched from their Glen Yard, Port Glasgow, a steel screw steamer of about 2,100 tons net register tonnage, and 3,600 gross tonnage, and to carry 5,400 tons deadweight, for the Argo Steamship Co. of Bremen. The vessel is intended for their American trade. The following are the principal dimensions:—Length between perpendiculars, 330 ft.; breadth, 45 ft. 6 in.; depth, moulded, to spar deck, 26 ft. 6 in. The vessel has been built to the highest class at Lloyd's on the deep frame system, and is fitted throughout with a double cellular bottom for water ballast, the after peak also being utilised for this. All the newest requirements for the quick loading and discharging and working of the ship have been supplied; shifting boards can be fitted, and the hatchways are arranged to act as feeders when carrying grain in bulk. The vessel is schooner rigged, and the top masts are made to telescope, so that the vessel can pass under the bridges on the Manchester Canal. The accommodation for the officers and crew is of the most complete description, the saloon, captain's room, and two spare state rooms being in large deck-house on bridge deck. The officers' and engineers' rooms are housed alongside engine casing, and are replete with every comfort, while the crew are berthed under the topgallant forecastle. The machinery, which is being supplied by Messrs. David Rowan & Son, of Glasgow, is on the triple-expansion system; the cylinders are 24 in., 40 in., and 65 in. diameter, by 42 in. stroke, steam being supplied by two large boilers working at 180 lb. pressure. As the vessel left the ways she was gracefully named the *Asia*, by Mrs. Segelken, wife of Captain Segelken, who has superintended the construction of the vessel.

Engineer.—On December 13th the Grangemouth Dockyard Co. launched from their yard at Grangemouth a handsomely modelled steel screw steamer, which has been built to the order of Messrs. Tatham, Bromage & Co., of London. The dimensions of the vessel are, 198 ft. between perpendiculars, by 30 ft. by 15 ft. 4 in. moulded, and she has been built specially with a view to the carriage of heavy weights. The engines are fitted in the after part of the vessel, the entire length to the collision bulkhead being one clear hold free from pillars and such obstructions, the main hatch, 48 ft. in length, so as to admit long pieces of machinery, boilers, or other goods. Steel derricks and unusually powerful winches are provided for the purpose of handling weights up to ten or fifteen tons. Comfortable accommodation is provided in the bridge before machinery space for captain, few state-rooms, and saloon. A cellular double bottom for water ballast is fitted the whole length of the hold, and the nett tonnage of the vessel has been reduced to the lowest possible point. Triple-expansion engines of large power with large boiler working at 170 lbs. pressure, will be fitted, and the vessel equipped with all the latest appliances, including steam windlass, steam steering gear, steam warping capstan, and special hold ventilation. The construction of the hull and machinery has been superintended by Mr. Walter Phillips, 96, Leadenhall Street, London, and Mr. G. B. Wemyss, 5, Oswald Street, Glasgow. As she left the ways, the vessel was gracefully named *Engineer* by Miss Macintosh, of 15, Inverleigh Terrace, Edinburgh. The owners were represented by Mr. Arthur Bromage, London. After the launch the company were entertained to cake and wine at the dockyard, when the usual toasts were proposed and responded to.

Recovery.—On December 13th Messrs. Wm. Simons & Co., Limited, launched from their yard at Renfrew, complete with steam up, a vessel named *Recovery*, constructed to the order of the British Admiralty for special service in connection with Plymouth Breakwater. The hull of the vessel is built of steel in accordance with the usual Admiralty requirements, and in addition the shell and deck are sheathed with teak. She has an upper and lower deck, each being fitted with three lines of rails for the conveyance of 16 trucks loaded with stones. The trucks will be taken on board the vessel over the bow with their full load. A 20-ton steam crane, constructed by Messrs. G. Russel & Co., Motherwell, is provided for lifting and lowering the trucks and discharging same over the side. Special shear-legs are also provided for the recovery of stones up to a weight of seven tons. The engines and boiler are of the most improved type. Suitable accommodation is provided for officers and crew. Her berth in the yard will be occupied by a dredging vessel on order for the Russian Government.

Diamante.—On December 14th there was launched by Messrs. Hall, Russell & Co., Limited, Aberdeen, a steel screw passenger and cargo steamer of 2,000 tons gross register, which has been built to the order of the China and Manila Steamship Co., Limited, Hong Kong, is 271 ft. 9 in. in length, 37 ft. broad, and 25 ft. deep. She has been fitted with all the modern appliances, and her triple-expansion engines have cylinders capable of developing 1,800 I.H.P. The steamer was named the *Diamante*.

Idomeneus.—On December 15th Messrs. Scott & Co., Greenock, launched a steel screw steamer of 6,700 tons gross for the Ocean Steamship Co., Liverpool. The vessel, which was named the *Idomeneus* will have a carrying capacity of 8,200 tons. Her dimensions are as follows:—Length, 440 ft.; breadth, 52 ft. 6 in.; depth, 33 ft. 6 in. Messrs. Scott will supply the steamer with engines of 4,500 H.P. The steamer is the first of eight vessels which Messrs. Scott are building for the Ocean Co., and four of the steamers will have a carrying capacity of 9,000 tons.

Polaris.—On December 15th Messrs. Gourlay Bros. & Co., Dundee, launched a steel screw steamer for the Finska Steamship Co., Helsingfors, Finland. Her dimensions are:—Length, 280 ft.; breadth, 38 ft.; depth, 23 ft. 3 in.; gross tonnage, 2,050. As the vessel left the ways she was christened the *Polaris* by Mrs. C. G. Gourlay.

Waiwera.—On December 15th Messrs. William Denny & Brothers launched from their yard at Dumbarton a large screw steamer named the *Waiwera* for the colonial trade of the Shaw, Savill & Albion Co., Limited, London. The dimensions are—440 ft. length over all, 54 ft. moulded breadth, 40 ft. 10 in. moulded depth. The vessel has been built to the highest class at Lloyd's. She has three complete steel decks and a shade deck for part of her length amidships. In a deckhouse on the shelter deck amidships there is accommodation for a limited number of first-class passengers and the officers and engineers. Aft on the upper deck she has accommodation for a very large number of third-class passengers. This accommodation is portable, and the space can easily be made available for carrying cargo when there are no passengers. On the shelter deck aft there is a large deckhouse containing the steering gear, third-class companion, hospital, &c. The crew and firemen are berthed in the forecastle. The deck and cargo arrangements are of the most approved type, and every care has been taken to make these complete. She has 11 steam cargo winches in addition to a powerful windlass and capstan. The rudder is of the latest pattern, single plate with Lawson's patent bearing arm. Having been built for carrying frozen mutton from New Zealand, there is a complete installation of refrigerating machinery of Haslam, of Derby. This consists of two large machines, one forward for cooling the air in the forward holds and one aft for the after holds. Three out of the five holds are insulated up to the upper deck. The vessel is rigged as a three-masted schooner with yards on the foremast. The engines have been built by Messrs. Denny & Co., and consist of a set of triple-expansion engines and five boilers. The christening ceremony was performed by Miss Galloway, daughter of Mr. John Galloway, Kilmeny, Ardrossan, one of the directors of the company.

Nairnshire.—On December 16th there was launched by the Clydebank Engineering & Shipbuilding Co., Limited, the cargo-boat *Nairnshire*, one of two vessels which the builders have had under construction for Messrs. Turnbull, Martin & Co., of London, and is intended for the New Zealand trade. The fore-holds are completely insulated and fitted up for the purpose of carrying frozen mutton, the carrying capacity being over 100,000 carcases. The refrigerating machinery is of the Linde type. The ship is propelled by a single screw; the engines are of the triple-expansion type and the boilers are arranged with Howden's system of forced draught. The vessel is likewise fitted for carrying a small number of cabin passengers, and very complete arrangements are made for their comfort and for the ship's officers in a commodious bridge-house. The *Nairnshire* is fitted throughout with electric light, and is equipped in accordance with the requirements of the Board of Trade. The construction of the ship has been carried on under Lloyd's special survey, and the owners have been represented at Clydebank by Messrs. Weir & Campbell.

Alexander Golovatcheff.—On December 16th Messrs. Wm. Simons & Co., Limited, Renfrew, launched complete with steam up from their yard the *Alexander Golovatcheff*, being the fourth powerful barge loading dredger which they have recently constructed for the Russian Government. This vessel has been constructed under the inspection of and is also classed by Bureau Veritas. Independent steam hoisting gear is provided for manipulating the bucket ladder, and also independent steam winches are fitted at bow and stern for manœuvring the vessel when at work. Electric light is fitted on deck and throughout the vessel for working day and night. There are separate cabins for the officers and crew, and private cabin on deck is also provided.

Plasma and Prase.—On December 17th Messrs. Carmichael, Maclean & Co. launched at Greenock two steel screw steamers, as follows:—The first steamer is 135 ft. by 23 ft. by 11 ft., moulded; the gross tonnage is 300 tons, and the vessel will carry a deadweight of 360 tons. This vessel was named the *Plasma*, the ceremony being performed by Miss Mary L. Fleming, Glasgow, and is to the order of Mr. Wm. Robertson, J.P., Glasgow. The second steamer is 135 ft. by 21 ft. by 10 ft. 6 in., moulded; the gross tonnage is 275 tons, and the vessel will carry a deadweight of 320 tons. She was named the *Prase*, the ceremony being performed by Miss Margaret H. Fleming, Glasgow. These steamers have been constructed to Lloyd's highest class of the well-deck type, and are fitted with all the latest improvements. Both vessels are to be supplied with compound engines by Messrs. Muir & Houston, Glasgow.

Den of Ogil.—On December 19th there was launched at Port-Glasgow, by Messrs. Russell & Co., a steel screw steamer of about 4,000 tons gross, which has been built to the order of Mr. Charles Barrie, Dundee. The dimensions are:—360 ft. long, 49 ft. 9 in. beam, and 28 ft. depth of hold. She is expected to carry 6,400 tons cargo on a draught of 22 ft. 8 in. The loading and discharging arrangements are very complete, the vessel being provided with 10 derricks with powerful steam winches for the rapid handling of cargo. The ventilation of the vessel has also had special attention, there being four large ventilators in each hold to ensure the safe carriage of jute and cotton. The saloon and cabins for officers and engineers are all on top of the bridge deck, and accommodation is also provided for eight passengers. Powerful triple expansion engines of 2,000 I.H.P. will be fitted by Messrs. Blackwood & Gordon, Port Glasgow, which will enable the vessel when loaded to maintain a speed of ten knots. As the vessel left the ways she was gracefully christened *Den of Ogil* by Mrs. Barrie.

LAUNCH.—IRISH.

Medic.—On December 16th there was launched from the yard of Messrs. Harland & Wolff, Belfast, a large twin-screw steamer for the White Star Line named the *Medic*. She is a vessel of about 12,000 tons gross register, and her displacement will exceed 20,000 tons. Her dimensions are:—Length, 550 ft.; beam, 63 ft.; depth 44 ft. The *Medic* is the 13th steamer of the White Star fleet propelled by twin screws.

LAUNCH.—GERMAN.

Jupiter.—On November 24th the Flensburg Shipbuilding Co. launched from their yard a finely modelled steel screw steamer; to the order of Messrs. Schmidt & Hansen, Flensburg. Her principal dimensions are:—Length, between perpendiculars, 270 ft.; breadth moulded, 38 ft. 10 in. and depth moulded 18 ft. 2 in. class 100 A1 at Lloyds, with quarter deck and partial awning deck and is to carry 2,050 tons at 17 ft. mean draft. On leaving the ways she was christened the *Jupiter* by Miss Elline Schmidt.

TRIAL TRIPS.

Tantallon.—On November 17th the new screw steamer *Tantallon*, built by Messrs. John Readhead & Sons, West Dock, South Shields, to the order of Messrs. Maclean, Doughty & Co., West Hartlepool, was taken to sea on her official trial trip, and had a series of successful runs, averaging a speed of 12 knots. The vessel, which is 335 ft. long over all, 47 ft. broad, and 25 ft. deep, is of the improved single-deck type, with full poop, long bridge amidships, with cabin-house on deck for captain and officers, and topgallant forecastle for crew, and has a large deadweight capacity on a light draught. She has been built under special survey, is classed 100 A1 at Lloyd's, and is fitted with all the latest improvements and appliances for the working of the vessel and for the rapid loading and discharging of cargo. Her engines, which have also been constructed by Messrs. John Readhead & Sons, are of the triple-expansion type, having cylinders 24 in., 40 in., and 64 in. by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lbs. per square inch. After the trial, which was in every way satisfactory both to builders and owners, the vessel returned to the Tyne to load for Genoa, under the command of Captain Berry.

Steamer.—On November 19th the steamer which has just been completed by Messrs. Wood, Skinner & Co., Limited, of Bill Quay on Tyne, for Messrs. T. & W. Smith, of Newcastle, left the Tyne, fully laden, for her trial trip. The vessel is of the following dimensions, viz.:—Length, 218 ft.; breadth, 30 ft.; and depth, 16 ft.; and is fitted with all the latest appliances for the expeditious handling of cargo. The engines, which are by the North-Eastern Marine Engineering Co., Limited, of Wallsend-on-Tyne, have cylinders 17 in., 28 in., and 46 in. in diameter, by 30 in. stroke. During the trial the machinery worked to the satisfaction of all concerned. After the trial trip the vessel proceeded on her voyage to Plymouth

Universe.—On November 21st the steel screw steamer *Universe*, of the self-trimming trunk type, recently launched by Messrs. John Priestman & Co., at Southwick (full particulars of which we gave in our launch columns, November issue, page 328), left the Wear for her trial trip. She was taken several times over the measured mile, the engines working without a hitch, and a mean speed of over 10½ knots was attained, which was considered very satisfactory.

Virginian—On November 22nd Messrs. F. Leyland & Co.'s steamer *Virginian* was taken out from Liverpool for her trial trip, after being fitted with new boilers and her engines altered into the high-pressure compound system by Messrs Fawcett, Preston, & Co., Limited, Liverpool. The boilers are constructed for a working pressure of 160 lbs. and are two in number, double-ended, 14 ft. 2 in. diameter by 16 ft. 6 in. long, each having six furnaces, and fitted with Henderson's patent automatic self-cleaning furnaces. The new cylinders are 29 in. and 77 in. diameter respectively, by 5 ft. stroke. The owners were represented by Mr. Neville Evans, superintending engineer, and Mr. Glynn, jun. The trip included a run to Anglesea and back, and during the whole of the time the machinery worked with smoothness, without a hitch of any kind. This is the tenth vessel for the same owners that has been fitted with new boilers and had its engines altered to the improved high-pressure compound system by Messrs. Fawcett, Preston, & Co., Limited. The alterations to these vessels have been designed and carried out under the superintendence of Mr. Neville Evans, the superintending engineer of Messrs. F. Leyland & Co., Limited

Sicilia.—On November 23rd the trial trip of the *Sicilia* steamship, built by the Fevig Jernskibsbyggeri, of Arendal, Norway, for the Otho Thoresen Linie, took place. The dimensions of the vessel are:—Length, 213 ft.; breadth, 30 ft.; load draught, 14 ft. The engines are by Sir Christopher Furness, Westgarth & Co., Limited, Middlesbrough, the cylinders being 16½ in., 27 in., and 44 in. by 30 in., with an extra large boiler working at 170 lbs pressure. During the trial trip the engines worked without the slightest hitch, and although there was a heavy sea running the vessel proved an exceptionally good sea boat, and Mr. Henriksen, the owners' representative, expressed himself highly satisfied with the vessel and her machinery.

Esk.—On November 25th. the steam fleeter *Esk*, built by the Irvine Shipbuilding and Engineering Co. Limited, Irvine, to the order of Messrs. Mackie & Thomson, shipbuilders, Govan, for Messrs. J. Leyman & Co. Limited, Hull (of which we gave particulars in our launch columns, November issue, page 333), went down the Clyde on her official trial. On the trip the machinery worked very smoothly, and after adjusting compasses and a satisfactory run, the vessel proceeded direct to Hull. This is the second of an order for six placed by Messrs. Mackie & Thomson some time ago with the Irvine Co. for the same firm.

Pelican.—Lately, the powerful twin-screw steamer *Pelican*, recently built by Messrs. Fleming & Ferguson, Limited, Paisley, for the Government of Western Australia, completed her speed and towing trials. On the measured mile she attained half-a-knot in excess of the guaranteed speed on both trials. The vessel is handsomely fitted for the accommodation of officers and crew. She has complete installation of electric light, including powerful search-light, and is fitted with all modern appliances for convenient and economical working.

Mars.—Lately, the cargo steamer *Mars*, built by Messrs. Furness, Withy & Co., at the Middleton Shipyard, Hartlepool, for Mr. John Lockie, Newcastle-on-Tyne (full particulars of which we gave in our launch columns, September issue, page 247), has had her official trial trip in Hartlepool Bay. After adjusting compasses she proceeded with a large number of visitors and officials on board to complete her speed trial, and after running four consecutive hours she attained the satisfactory speed of 11½ knots.

Virgo.—Lately, the s.s. *Virgo*, built by the Grangemouth Dockyard Co. for the Finska Steamship Co., of Helsingfors, Finland (full particulars of which we gave in our launch columns, November issue, page 333), went down the Firth of Forth to Aberlady Bay on her official trial trip. As a mean of the runs on the measured mile the speed attained was 10.8 knots, being over ½ of a knot in excess of the guaranteed contract speed. The vessel then went on a continuous run of six hours at full speed, during which the engines worked smoothly and without a hitch or stoppage. At the conclusion of the trial the owners' representative expressed himself as more than satisfied with the results.

Sifka.—On November 25th the new steamer *Sifka*, recently launched by Messrs. Ramage & Ferguson, Limited, Leith, for Messrs. J. T. Salvesen & Co., Grangemouth (of which we gave full particulars in our launch columns, November issue, page 332), went on her trial trip in the Firth of Forth. The weather was of the worst description, there being a strong gale of wind from the East, with a heavy sea. Notwithstanding this the very satisfactory speed of 11½ knots was obtained, the machinery throughout the day working without a hitch. This steamer is the fourth built by Messrs. Ramage & Ferguson, Limited, for the same owners, and early the following week she proceeded to the Tyne to load.

Syria.—On November 26th the s.s. *Syria*, a new trader to run between Goole and Boulogne in the service of the Bennett Steamship Co., Limited, of Goole, which has just been completed by Earle's Shipbuilding and Engineering Co., Limited, Hull, underwent her trials at the mouth of the Humber. The vessel, which is 210 ft. long, is fitted with triple-expansion engines, having cylinders 19 in., 32 in., and 52 in. in diameter, by 36 in. stroke, supplied with steam from two single-ended steel boilers working at 180 lbs. pressure. The results of the test were most satisfactory, an average speed of close upon 14 knots being obtained with the engines running at 95 revolutions, and indicating about 1,300 H.P.

Londesborough.—On November 28th the fine steel screw steamer *Londesborough* left the port of the Hartlepools for her maiden voyage. She has been built by Messrs. Wm. Gray & Co., Ltd., to the order of Messrs. G. R. Sanderson & Co., Hull (full particulars of which we gave in our launch columns, September issue, page 249). The ship and machinery have been built under the superintendence of Mr. Robert Carson, consulting engineer, Hull, and that gentleman, together with the owners' superintendent engineer, Mr. McInnes, was present at the trial. The trial was a very satisfactory one, and on its conclusion the vessel at once proceeded in ballast to New Orleans.

Turkistan—On December 5th the large steel screw steamer *Turkistan* left the port of the Hartlepools for her trial trip. She has been built by Messrs. Wm. Gray & Co., Limited, for Messrs. Frank C. Strick & Co., Limited, of Swansea and London (of which we gave full particulars in our launch columns, October issue, page 289). The vessel left the port about 10 a.m. for the Tyne, where she takes in a cargo of coal for the use of Messrs. Strick's fleet of steamers in London. She had an excellent run round, the machinery working admirably, without any hitch whatever. A speed of 15 knots was easily maintained, the engines developing over 2,500 H.P., and the boilers keeping perfectly tight and furnishing a plentiful supply of steam. Mr. Archibald Walker, who has superintended the construction of ship and machinery, was there on behalf of the owners, Captain Murrell represented the shipbuilders, and Mr. W. C. Borrowman the builders of the engines. There were also a couple of visitors present—Mr. Lees, of Messrs. Rait & Gardiner, London, and Mr. Jas. Edmiston, a son of Mr. J. B. Edmiston, superintendent engineer to Messrs. Hamilton, Fraser & Co., of Liverpool.

Dunscore.—On December 6th the new steel screw steamer *Dunscore* went down the Clyde on her trial trip. The *Dunscore* (of which we gave particulars in our launch columns, December issue, page 374) was built to the order of Messrs. Paton & Hendry, Glasgow, by Messrs. J. M'Arthur & Co., Paisley. In a gale of wind the *Dunscore* behaved admirably, and demonstrated thoroughly her ability in hard weather. The engines, which were supplied by Messrs. Bow, M'Lachlan & Co., Paisley, worked very well, and despite the stormy weather, a speed of nine knots was easily obtained, being in excess of contract speed. Immediately after trial on the mile, the *Dunscore* went to Ardrossan to load.

Malang.—On December 12th the s.s. *Malang*, which has been built by Messrs. Wigham Richardson & Co., at their Neptune Works, Newcastle-on-Tyne, for the Rotterdamsche Lloyd of Rotterdam, went for a very successful trial trip off the River Tyne. The steamer is built of steel, to take the highest class in the Registry of the Bureau Veritas, and is 333 ft. in length by 44 ft. 2 in. beam. She is rigged as a fore and aft schooner, and has very comfortable accommodation for a limited number of first-class passengers. The propelling machinery, which has also been constructed by Messrs. Wigham Richardson & Co., consists of a set of triple-expansion engines. On the trial trip these worked without the slightest hitch, and drove the vessel at a speed of 11¾ knots per hour. The owners were represented by Mr. B. Ruys, of the firm of W. Ruys & Sons, Rotterdam, managers of the Rotterdamsche Lloyd, and by Mr. J. de Bruyn Kops, naval architect of the Hague, under whose superintendence the vessel, with her engines and boilers, has been built, and the builders were represented by Mr. J. Denham Christie and Mr. G. B. Richardson.

Abergeldie.—On Wednesday, December 14th, the trial trip of the s.s. *Abergeldie* took place. She was recently launched from the yard of the Sunderland Shipbuilding Co., Limited (of which we gave full particulars in our launch columns, December issue, page 371.) The trial trip passed off most successfully in every way, and a mean speed of 10½ knots was obtained on the measured mile in spite of the very high wind. The owners and their representatives, who were on board, were highly satisfied. The vessel proceeded direct on her voyage to New Orleans.

Svend Haug.—On December 16th the s.s. *Svend Haug* proceeded down the Firth for her machinery trials. The *Svend Haug* is a fine screw steamer of the raised quarter-deck type, built for cargo carrying purposes by the well-known firm of S. McKnight & Co., Limited, Ayr, for Norwegian owners. The dimensions of the vessel are 180 ft. by 29 ft. by 13 ft., and she is capable of carrying close upon 800 tons deadweight on a very small registered tonnage, while at the same time she has a large cubic capacity. The *Svend Haug* has been constructed to the highest class of Norwegian Veritas under special survey, and is of specially strong construction for loading aground and for sailing among ice. Steam steering gear is fitted amidships, and powerful steam winches for the quick handling of cargo. At the after end there is fitted over the rudder a new patent combined warping capstan and steering gear, which has been specially designed for this vessel and constructed by the engineers. On the measured mile at Skelmorlie six runs were taken, and a mean speed of 10·2 knots was attained, the vessel being fully loaded. The machinery has been supplied by Messrs. McKie & Baxter, engineers, Govan, and has also been constructed under Norwegian Veritas rules for the highest class. It consists of a set of triple-expansion engines 15 in., 25 in., and 40 in. by 27 in. stroke, supplied with steam from an extra large horizontal return-tube marine type boiler. The job is a very high-class one throughout, and besides the ordinary fittings the vessel is supplied with Morison's evaporator, a Harris' filter, Cochran's donkey boiler, Baxter's steam reversing gear, pulsometer pump for ballast purposes, two Worthington type donkey engines, and a large outfit. The shafting is all in excess of the Norwegian Veritas rules, and the boiler working pressure is 175 lbs. Steam heating by patent "D.S.S." heaters and steam to the bathroom has been supplied. During the trials the whole machinery worked without a hitch, and one of the special features of the job was the high speed and safety with which the engines could be handled with the steam reversing gear, without the necessity of a hydraulic cushion in the cylinder. After completion of the speed and consumption trials, which were highly satisfactory, the vessel proceeded on her maiden voyage.

Miles Coverdale.—On December 20th the s.s. *Miles Coverdale* had her trial trip in Hartlepool Bay. The vessel has been built by Messrs. Wm. Gray & Co., Limited, to the order of Messrs. John Coverdale & Son, of West Hartlepool (full particulars of which we gave in our launch columns, December issue, page 369). After adjustment of compasses by Mr. Berry the capabilities of the ship were thoroughly tested, complete satisfaction being expressed both with the manœuvring of the ship and the smooth and steady running of the machinery. The vessel was now headed for the Tees, arriving at Middlesbro' about 1.30 p.m., where she loads for Alexandria. On the way round the genial and esteemed superintendent of the firm of Messrs. Coverdale & Son, Mr. Airey, invited the staff of experts, together with Mr. S. D. Kikkert, Dutch naval engineer, who is on a visit to this country, to the saloon, where refreshments were partaken of and a very enjoyable hour spent.

Mountby.—On Tuesday afternoon, December 20th, Messrs. Wm. Gray & Co., Limited, sent to sea for her trial trip the fine large screw steamer *Mountby*, which they have built for Messrs. S. Ropner & Co., West Hartlepool (full particulars of which we gave in our launch columns, December issue, page 369). The vessel proceeded to Tyne Dock, where she is to load for Genoa, and was accompanied on the voyage round by Mr. Robt. Ropner, junr., and the firm's engineer superintendents, Messrs. Nicholson & Rooke. The *Mountby* made a very satisfactory run round, not the slighest hitch arising, and the above-named gentlemen expresed themselves as being highly pleased and satisfied with the vessel's performance.

Britannic.—On December 8th the s.s. *Britannic* went to sea on her official trial trip. She is a fine large steel screw steamer, and is the sixth vessel which Messrs. Wm. Gray & Co., Limited, have built for the same owners, Messrs. W. H. Cockerline & Co., of Hull, (full particulars of which appeared in our launch columns, November issue, page 328), the trial took place in Hartlepool Bay, and was witnessed by the senior partner in the firm, Mr. W. H. Cockerline; Mr. G. H. Strong, M.I.N.A., of Hull, under whose superintendence the vessel and machinery have been constructed; and Captain Murrell and Mr. W. C. Borrowman on behalf of the shipbuilders and engine builders respectively. The performance of both vessel and machinery were in every way satisfactory. The *Britannic* on the conclusion of the trial at once proceeding on her voyage to Cardiff, where she loads for Colombo.

Gas and Petroleum Engines. Translated and adapted by A. G. Elliott, B.Sc. London: Whittaker & Co., 1898.

This little book is an adaptation of a work by M. Henri de Graffieny. It forms one of its publishers' electro-mechanical series, and contains an interesting account of the development of the gas engine and of the persistence with which inventors followed out the perfection of its mechanical details through difficulties of no ordinary nature, so as to realise much of the theoretical efficiency which they know to be possible. The cost of installation and working of the numerous types of gas and oil engines are here set out, and much attention is given to the clear explanation of the theory of these machines. The author writes in a clear and simple manner high mathematical explanations being carefully avoided. Largely as these motors are already relied on (and we hardly realised the extent of their introduction till we read the present book) it seems possible that their work will be still much further extended. That being so, the little volume before us seems opportune, and may be very usefully perused by those who wish to grasp the details of such modern power generators.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—ED. M. E.]

DEFECTS IN PROPELLER SHAFTS.

To the Editor of the MARINE ENGINEER.

SIR,—In your February and March numbers appears the very interesting paper by Mr. M. W. Aisbitt, on certain defects found in propeller shafts, and the discussion thereon.

I think the corrosion at the end of brass liners on the shaft could be remedied by broad rings of wrought iron or other metal than brass, put on in halves and pinned tightly to shaft, thereby allowing the corrosion to take place on a part that could easily be renewed without condemning the shaft; although I am of opinion the plan of brassing the shaft from end to end is preferable, as I have experienced several of such, though Mr. James Adamson quotes a case of the brass between stern bush and gland, becoming so encrusted with scale that it was impossible to draw the shaft without drawing the stern tube as well. This could be guarded against by turning the brass to a smaller diameter than at bush and gland parts.

Another cause for rapid corrosion *might be* the quality of the brass used for liners, as in some shafts I have seen it has been more rapid than in others; yellow brass containing a large proportion of zinc seeming to have been the worst, while the tin alloys showed least. I should also think that casting the brass with the shaft vertical, and allowing good wells for a flow of metal on top would ensure a good casting, as it is important there should be no blow holes by which water could reach the shaft.

I do not think the use of white metal at all safe on a propeller shaft, as I can quote instances where the ship got into shallow water and sand and probably shells got into the bush, causing the shaft to jam, it being necessary to draw both stern tube and shaft together and melt the white metal out. Certainly white metal makes a fine running journal where it can be kept clean and oiled.

Mr. Hawthorn's opinion that a good deal of corrosion goes on when the ship is in port, and the stern gland nipped up, thereby causing the water to become stagnant, has, to my mind, a deal of truth, as witness the bilious-looking water thrown out by the pumps from the condenser the first few revolutions of the engines after they have been stopped for a few days. No doubt the small quantity of water contained in the stern tube becomes highly charged with galvanic acid after lying around the brass for a time, in which case I should think it preferable to allow a small flow of water through the stern gland, while the engines are stopped.

It does seem a barbarous method, as the same gentleman said, to allow water in the stern tube at all.

Several years ago I drew a plan of a stern tube with packing gland outside, recessed into stern post, and manipulated by two bolts working in water-tight stuffing boxes through stern post above and below the shaft, and continued by rods through peak tank to inside stern gland on bulkhead. The stern tube also being intended to be made in halves allowed the upper portion to be raised for examination of shaft. This might become a valuable adjunct in the event of breaking the shaft inside the tube, as the stern tube could easily be removed, and a Thomson's or other coupling applied to enable the ship to reach the port, as well as the external gland keeping water from the shaft.

The only objection I could think of was, in the event of a rope or chain fouling the propeller and becoming twisted up between the screw boss and the external gland, it might jam the shaft by forcing the gland hard on the packing.

I do not think Mr. Aisbitt's idea of allowing a certain amount of give in the after coupling to be a good one, as the breaking of coupling bolts is a serious matter; but, if adopted, would require a strong collar outside of coupling flanges, fast or solid on one and easy on the other flange, to prevent them getting out of line, should some of the coupling bolts break—otherwise there would be a grave risk of bending the shaft and breaking the stern tube.

The bolts, however, would be subject to a considerable amount of wear and tear. Some makers adopted this method in coupling crank and intermediate shafts; and I believe it was found to work satisfactorily, though, like the rudder-post bearing, it seems to be relegated to the past of late years—for what reason I do not know.

I have often wondered, considering the mortality of tail-end shafts, that superintending engineers do not specify them to be made heavier even than the crank and intermediate shafts, as the former have proved in 90 per cent. of breakages to be the weak part. I, say, 10 per cent. increase would not add much to the cost or weight, and would give a greater margin of safety than at present (vide Mr. Manuel's paper on "P. and O. Steamships' Shafts"), though he reduced the increase from 24 to 6 per cent., and seems to have found that sufficient.

The construction of hull in the large modern cargo carriers doubtless has a great deal to do with so many breakages, as when in ballast in a seaway the shafting is subjected to enormous strains, and also when loaded with heavy cargoes, stowed perhaps promiscuously in various parts of the ship, causes reverse strains, thereby "fatiguing" the shaft material.

With the advent of nickel steel, which seems to be a more reliable metal than mild steel or iron, let us hope there will be a great reduction in the failures of shafting in the future.

JOHN D. STUART,
Chief Engineer ss. *Stella*.
Auckland, New Zealand, October 19th, 1898.

RE DEIGHTON'S FURNACE.

To the Editor of the MARINE ENGINEER.

DEAR SIR,—In your issue of November 1st on page 322, you refer to Deighton's furnace having been tested against two other furnaces which are now in use. As your statement is no doubt based on a circular issued by the Deighton Flue Co., please note that this circular has been revised by the Deighton Co., and now contains no reference to the tests of other furnaces.

Kindly insert this in your next issue.

Yours faithfully,
TURNBULL & TILLY,
Solicitors for Mr. D. B. Morison.
West Hartlepool. December 2nd, 1898.

To the Editor of the MARINE ENGINEER.

DEAR SIR,—The attention of our clients Messrs. John Brown & Co., Limited, has been called to the paragraph in your issue of November 1st, and the statement you make with regard to Deighton's Furnace having been tested under Board of Trade regulations against two other patent furnaces, which are now much in use, and that Deighton's Furnace was found to have a much higher resisting power against possible collapse than either of the others.

No doubt this statement was founded on the circular issued by the proprietors of the Deighton Tube.

We desire to say that the comparison made was altogether misleading, inasmuch as like was not compared with like.

On behalf of Messrs. John Brown & Co. Limited, we were instructed to communicate with the proprietors of Deighton's Tube with regard to the comparison in question, and they upon the representations made, agreed to withdraw the circular, and to take care that no such comparison would appear in any future circular that they might issue.

Under these circumstances we shall be glad if you will, by publishing this letter, correct the false impression which your article upon engineering upon the Wear might possibly produce.

We are, dear Sir, yours faithfully.
YOUNGE, WILSON & CO.
East Parade, Sheffield. December 8th, 1898.

QUALIFICATION OF CANDIDATES FOR SURVEYOR-SHIPS UNDER BOARD OF TRADE AND LLOYD'S.

To the Editor of the MARINE ENGINEER.

DEAR SIR,—Could you inform me through the Correspondence columns of your excellent paper, as to how I could become a Surveyor of Engineering in Lloyd's or the Board of Trade, and what subjects I will have to study for any examinations I may have to pass, and oblige, yours truly,

JOHN C. SMITH.

19, Queen Street, Perth.

[The qualifications for a Board of Trade Engineer Surveyorship are that he must have at least five years' service at sea in charge of machinery and be in possession of a first-class certificate, must be over 25 years of age, and under 40, and by virtue of his experience and services, qualified to undertake surveys on the hull and machinery of steamships. Candidates in the first instance apply for form of application to the Under Secretary of Marine Department, Board of Trade, Whitehall, London, S.W., stating full particulars of age, abilities, experience, &c. This form being filled up, it receives the consideration of the Board, and if accepted as a candidate, the Board in the first instance appoints an interview, and if selected at that interview, the candidate then sits for a competitive examination in the theory and practical construction of engines and boilers, stability of ships, &c., and if successful at the competitive examination, he is subjected further to a Civil Service Examination, and again if successful he is appointed on one year's probation at a salary of £200 per annum, rising by annual increments of £10, subject to the Board's approval.

Lloyd's select from candidates of experience and ability, and I don't know of any Technical Competitive Examination.

N.B.—Extra Chief Engineer's certificates receive preference or both situations.—ED. M.E.]

THE "CAMPANIA."

To the Editor of the MARINE ENGINEER.

DEAR SIR,—I have just seen in the *Times* that the *Campania*, which had left Queenstown on the 30th October at 10.25 a.m., arrived at New York on Friday, the 4th November, at 10 a.m. Allowing 4 hours 30 minutes for difference of time, the actual passage would then have been made in under 5 days and 4 hours, some 3 hours and 26 minutes better than the record voyage of the *Lucania*. Nothing, however, is mentioned in the *Times* about this voyage more than the above. As it would be very interesting to have some particulars, I would be much obliged if you could give such in your next issue, as well as a comparison of this voyage with the best of the *Kaiser Wilhelm der Grosse* and *Kaiser Friedrich*.

Yours truly,
A CONSTANT READER ABROAD.

St. Petersburg.
November 11th, 1898.

[This letter is referred to in the "Fleets of the Mail Lines." —ED. MARINE ENGINEER.]

THE NORTH GERMAN LLOYD CO.

To the Editor of the MARINE ENGINEER.

SIR,—In the "Fleets of the Mail Lines," current number MARINE ENGINEER, some interesting statement of the performances of the *Kaiser Wilhelm der Grosse* appear. It is an extraordinary thing that these record speeds and passages should have altogether escaped our journals, engineering and otherwise, and I should like to have a detailed list of her passages up to the present (there have not been very many), so that I can bring my table of Atlantic Records up to date. I always thought that the Englishman's love of fair play would have induced him to give full publicity to all performances of foreign steamers which surpassed those of British. Yet now for the first time I see that this German vessel has maintained 22·51 knots for over 3,000 miles, which makes her half a knot faster than the *Lucania*. I should be very much obliged if your correspondent would kindly have the accompanying table filled up and either return it to me or have it published in his column, where I am sure it would prove of great interest. I am curious to see howt he regularity of her passages compares with that of the *Lucania*.

Might I be permitted to correct an error which has crept into this month's "Fleets of the Mail Lines?" It is stated that the old Holyhead mail packet *Ulster* has been transformed into a sailing ship. This statement also appeared in the Belfast press, and is erroneous, as I myself witnessed the breaking up of this vessel and the *Leinster*, and the removal of machinery, paddles, etc., from the same company's steamer, *Cavan*. It is the latter vessel which is now a ship.

I always read the columns referred to above with great interest, in fact, not being myself a marine engineer, I get your paper solely for the Mail and Naval Notes, from which I derive much information of an interesting character to myself, and I am sure many others.

I am, Sir,
Yours faithfully,
EDWIN A. R. KELLY.

Belfast, December 16th, 1898.

[This letter is referred to in the "Fleets of the Mail Lines." —Ed. M.E.]

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from November 3rd to December 1st. 1898.

22681	J. T. Emery. Preventing fishing-lines twisting.
22720	W. Kunert. Preventing incrustation in boilers.
22730	G. J. Churchward. Piston valves.
22737	F. Strickland. Internal combustion engines.
22766	W. H. Featherstone. Opening water-tight doors.
22811	C. K. Tutin. Ship's mushroom ventilator.
22869	J. Meek. Fitting the stock to ships' anchors.
22896	G. C. Marks (The Rubber Tire Wheel Company, United States). Anti-friction bearings.
22915	P. Genthe. Propeller.
22934	J. M. Ramsay. Rudders.
22935	J. M. Ramsay. Rudders.
22961	E. Hervais. Gauge for indicating pressure.
23012	J. E. Elliott. Propeller pitch finder.
23038	W. Foggo. Reversing gear.
23068	B. H. Thwaite. Armour plates.
23092	J. Thom. Air pumps for condensers.
23103	T. Kennedy. Hydraulic pumps.
23108	S. A. N. Deluce. Valve gear for engines.
23141	W. Railton, R. Campbell, and S. J. Railton. Propelling ships.
23153	J. S. Slater. Stopping shot holes in ships.
23154	J. Clifton. Protectors for gauge glasses.
23156	A. F. W. Krause. Attaching flags to staffs.]
23161	H. Barcroft. Driving gear for vessels.
23170	J. S. D. Shanks, R. Kelly, jun., T. Harrison, and J McCormac. Furnaces for steam boilers.
23185	A. Klerings. Gear for propelling boats.
23198	T. Barnes. Machines for hauling water.
23199	H. S. Cottrell. Boilers.
23212	J. A. McKinley. Rowlocks.
23283	J. Houston and R. C. Mathewson. Friction clutches.
23301	P. Mc L. Baxter. Steering and capstan gear.
23314	W. P. Mulie and B. H. V. den Berg. Life-boat.
23323	H. A. T. Stoakes. Reducing valves.
23337	P. O. Sas. Life raft.
23362	W. R. Dawe. Forming solid flanges upon shafts.
23367	T. Christie. Sustaining beds on ships, &c.
23372	J. B. Schafer. Collapsible water heater.
23380	P. Heffer. Steering and pumping steamships.
23411	L. L. Hartvigson. Submarine cables.
23429	W. J. H. Fresen. Valve for steam engines.
23459	W. C. Barnes and F. T. Harrington. Rudder cushion.
23460	F. Hamer. Rotary steam engine.
23476	A. A. Mills. Cross bridges for boilers.
23488	J. I. Booker. Steam boiler furnace flues.
23516	R. V. Froment. Internal combustion engines.
23517	J. Bell. Water-tight doors for bulkheads.
23526	H. Woods. Automatically closing doors.
23527	H. E. Gamble. Steam engines.
23528	J. Bernstein. Protecting lubricant.
23556	W. L. Wise (A. C. Crehore and G. O. Squire, United States). Submarine telegraphs.
23699	R. P. Strachan. Systems of electric propulsion.
23708	A. L. Brun and L. Leclerc. Water-tube boilers.
23711	K. Gamper. Corrugated tubes for steam boilers.
23731	G. Cockburn. Tubes for surface condensers.
23777	T. H. Ash. Corrugated iron for vessels.
23780	F. Lurssen. Lifeboats.
23795	B. K. Jamison. Treatment of armour plates.
23809	W. Mullan. Anchor cable compressors.
23862	J. Imler. Pistons.
23877	J. Steele, A. Olson, and P. N. Lindquist. Oars.

23906 A. Brand and J. M. Richards. Slide valves.
23929 E. Butterworth. Internal combustion engines.
23947 W. A. Pitt. Crank mechanism for engines.
23959 C. M. Linley and J. M. Wellington. Internal combustion engines.
24014 J. Jones. Folding canvas boat.
24024 C. Grayson and W. J. Thompson. Steam generators.
24035 D. Sherit. Otter trawl boards.
24044 J. W. Ray. Binnacles for ships' compasses.
24060 J. A. Rowe. Manœuvring warships.
24068 R. Hutchison. Steam boilers.
24083 W. E. Prall. Steam engines.
24084 W. E. Prall. Engines of the turbine type.
24091 T. D. Grimké-Drayton, T. Robinson, and A. Ball. Valves for cylinders of engines.
24097 W. Mitchell. Anchor.
24186 W. Mullan. Spar ceiling cleats for ships.
24193 J. A. Jamisson. Bearings for shafting.
24201 P. McQueen. Cradles for ships' boats.
24240 D. B. Walker. Winding ropes for trawl gear.
24241 D. B. Walker. Otter trawl boards and nets.
24246 C. P. Horton. Pendent water-tube boilers.
24257 C. E. Vernon and A. Ross. Testing lubricants.
24258 A. W. Murray. Speed indicator.
24287 R. H. Taylor. Packings for pistons.
24301 G. de Beer. Propelling boats.
24323 H. Kastrup. Steam generators.
24366 A. C. Brown & R. Burn. Packing rings.
24369 F. N. Lyons. Lifeboats.
24380 E. Taylor & S. T. Taylor, jun. Boilers.
24435 W. H. Bailey. Recording the movements of ships.
24437 J. Thom. Engines.
24443 F. Pearson. Preventing pumps clogging.
24461 M. H. Robinson. Water-tube boilers.
24464 H. & S. H. Hawkins. Float-actuated engine.
24473 J. W. Muse. Thrust blocks.
24500 J. Blake. Steam generators.
24541 F. Strickland. Internal combustion engines.
24562 M. Chenivesse. Floating vessels.
24613 J. R. Bell. Grab dredgers.
24614 J. E. Carroll. Water heating for steam boilers.
24664 G. Wilson. Utilising the force of water currents.
24713 A. J. Amos. Propeller-shaft bearings.
24729 H. E. H. Smedley. Preventing ships sinking.
24804 W. Kirchner. Preventing incrustation in generators.
24832 W. Buckley. Packing rings for pistons.
24852 J. Mazières. Water-tube boiler.
24867 D. Morell. Rotary steam engines.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

November 12th, 1898—*contd.*

Salkeld, J. K. ... 2C London
Simpson, Alex. 1C N.Shields
Sneddon, J. P. 2C Greenock
Thornton, J. W. 2C N.Shields
Timothy, David 2C London
Tuckey, Fred. R. 1C ,,
Watts, Robt. S. 2C Leith
Whiting, Thos. 1C N.Shields

November 19th, 1898.

Bain, Wm. .. 2C Glasgow
Baker, Clifford 1C Cardiff
Bready, John E. 2C ,,
Campbell, J. W. 2C Glasgow
Campbell, Thos. 1C Cardiff
Cantell, P. G... 2C Bristol
Christerson, WC. 2C Glasgow
Clark, Geo. .. 1C ,,
Dilly, N. E. T... 2C London
Dunbar, Jas. R.. 1C Liverpool
Dunning, Hugh 2C ,,
Dwyer, John ,. 2C Cardiff
Engelbrecht, CT 1C W.H'pool
Escott, A. B. S. 1C N.Shields
Gillespie, Wm. Y 2C London
Greig, Robt. L. 2C Glasgow
Hall, Wm. T. .. 2C Cardiff
Hamilton, R. M. 2C W.H'pool
Haynes, T. .. 1C Glasgow
Horn, Sylvester 2C Liverpool
Ibbetson, Wm. 2C ,,
Jones, Wm. .. 1C Cardiff
Kearsley, George 2C W.H'pool
King, Thomas,. 2C Cardiff
Lennox, Alex... 1C Glasgow
Lobban, J. T... 2C N.Shields
Lofley, H. E. .. 2C Dundee
Lunt, Geo. F... 2C Liverpool
M'Dougall, H... 2C London
Muir, Hugh .. 2C Glasgow
Nicoll, Thos. L. 2C Cardiff
Oliver, John W. 1C ,,
Paul, Ernest E. 2C London
Penrose, John H. 1C N.Shields
Rawsthorne, G. 1C Liverpool
Regan, John .. 2C Cardiff
Roberts, Geo. .. 2C London
Robertson, E B. 1C Dundee
Robertson, Wm. 1C Glasgow
Roffey, A. G. ., 1C Liverpool
Russell, Thos. A. 1C N.Shields
Shaw, Robt. R. 1C Liverpool
Smurthwaite F Y 1C W.H'pool
Sutherland, A. 2C Glasgow
Tasker, James .. 1C ,,
Thomas, Wm. D. 2C Cardiff
Tulip, Thos. .. 1C N.Shields
Wade, Wm. B. 2C Cardiff
Watson, Chas... 1C London
Watty, Wm. C. 2C Dundee
Williamson, Alx. 2C Glasgow
Wilson, Alexr... 1C ,,
Wilson, Robt. S. 1C London

November 26th, 1898.

Agate, Charles.. 1C London
Best, Wm. R. .. 2C Sunderl'd
Burgess, Wm. B. 1C ,,
Carnegie, J. D. 1C ,,
Chapman, J. W. 1C ,,
Cowell, Rich. E. 1C ,,
Crookshank, B. 1C Liverpool
Dyer, John C... 1C London
Finlayson, Robt. 1C ,,
Forster, Ralph.. 2C N.Shields
Gunn, William.. 1C London
Harvey, Robt. .. 1C Aberdeen
Hellyer, Chas. P. 1C Hull
Honour, Michael 2C N.Shields
Lawson, S. W.. 2C Hull
Leech, Fredk. G. 1C London
Lindsay, Robt. J. 2C Liverpool
Mahon, P. J. F. 2C N.Shields
Malcolm, Jas. L. 2C Aberdeen
M'Bey, Robert.. 2C ,,
Murphy, M. F.. 1C Liverpool
Pascoe, Wm. .. 1C ,,
Penna, John .. 2C Falmouth
Potts, Geo. .... 1C Sunderl'd
Roberts, H. W. 2C Liverpool
Rutherford, F.. 1C ,,
Scott, Andrew.. 1C N.Shields
Scott, Henry M. 1C Aberdeen
Stuart, Geo. W. 2C Hull
Thomas F. R.. 1C Liverpool
Torrie, Geo.... 1C ,,
Vowell, Josias.. 1C N.Shields
Whyte, Arch. G. 2C ,,
Widdrington, S. 2C Liverpool
Wilson, Alex. .. 1C Aberdeen
Young, Wm. E. 1C N.Shields

December 3rd, 1898.

Appleyard, W.. 1C Glasgow
Banner, A. H... 2C Cardiff
Batey, Robt. W. 1C N.Shields
Bergh, Henry O. 1C London
Bowen, John R. 2C Liverpool
Bridge, Mark N. 1C ,,
Campbell, Allan 2C Glasgow
Chalmers, David 2C Liverpool
Chappel, H. W. 1C N.Shields
Clark, Thomas.. 2C Glasgow
Coleman, J. J.. 2C N.Shields
Daniel, Wm. C. 2C London
Davidson, R. A. 2C Liverpool
Evans, Percy P. 2C Cardiff
Ewing, John .. 2C Glasgow
Graham, Wm. A. 1C London
Guthrie, Hugh.. 1C Glasgow
Hay, John G. .. 1C ,,
Hayden, E. P.. 2C Cardiff
Hedderick, Alex. 1C Glasgow
Howell, Howard 2C London
Howie, A. J.... 1C Glasgow
Huntley, Fredk. 1C Cardiff
Joyce, John J.. 2C ,,
Maughan, C. H. 2C Cardiff
M'Gillicuddy, J. 2C London
Nicholson, F. S. 2C Liverpool
Paul, John .... 1C Glasgow
Preshous, Alfred 2C N.Shields
Proudfoot, F. .. 1C Glasgow
Rose, Thos. W. 2C London
Smith, H. R. .. 2C Glasgow
Smith, Richard 2C ,,
Sorensen, V. G. 2C Cardiff
Stoddart, J. C.. 1C Liverpool
Strachan, I. D. 1C Glasgow
Straton, J. K., 2C Cardiff
Storey, John D. 2C N.Shields
Styles, James A. 1C Cardiff
Talbot, Charles. 1C London
Tongue, John F. 2C N.Shields
West, Geo. C. .. 2C Liverpool
Young, W. H.. 2C Cardiff

December 10th, 1898.

Alder, John G. 2C N.Shields
Cardin, Vincent 2C ,,
Cook, W. A. G. 2C London
Findlay, David 1C ,,
Heron, Alexr. J. 1C Liverpool
Innes, C. B. .. 2C ,,
Jones, W. F. .. 2C ,,
Lawson, C. F... 2C N.Shields
Leck, James .. 1C Liverpool
Morrison, B. .. 2C N.Shields
O'Sullivan, M. J. 2C Liverpool
Phillips, P. J... 2C ,,
Quinn, M. N... 1C ,,
White, J. O. .. 2C N.Shields

December 17th, 1898.

Adamson, W. .. 2C Leith
Anderson, W. .. 2C Liverpool
Brock, John G. 1C N.Shields
Calder, C. S. .. 2C Leith
Campbell, Jas.. 2C ,,
Campbell, Wm.. 2C Greenock
Campkin, W. E. 2C N.Shields
Chalmers, J. .. 1C Greenock
Colling, Tom .. 2C N.Shields
Cunningham, G. 2C London
Cuthbert, G. B. 1C Greenock
Edwards, J. T. 1C Liverpool
Edwards, W. S. 2C Hull
Foulds, John .. 2C London
Gillam, James .. 2C Greenock
Gordon, John S. 1C ,,
Hastilow, A. H. 1C N.Shields
Hattersley, A... 1C London
Henderson, A... 2C London
Henderson, W .. C1 Liverpool
Hepburn, J. M. 2C ,,
Hewitt, Geo. F. 2C Hull
Hutchinson, I... 1C Liverpool
Jones, John .... 1C ,,
Jordan, A. E. .. 1C London
Lewis, W. H. .. 2C Liverpool
Martin, James.. 2C Greenock
Maxwell, Herbert 1C N.Shields
Meleckot, N. J. 2C Liverpool
Michael, R. W. 2C ,,
Millar, John P. 2C Greenock
M'Lachlan, J... 2C Leith
M'Pherson, W. 1C N.Shields
Parkin, T. W... 1C London
Reid, Geo. H... 2C Liverpool
Reid, Wm. H... 1C Dublin
Saxon, H. V. .. 2C London
Story, Ralph .. 2C N.Shields
Taylor, J. A. .. 2C Hull
Thomas, A. G. 1C Liverpool
Thomas, H. O. 1C ,,
Tolman, J. A... 1C ,,
Tranent, R. B. 2C Leith
Williams, H. .. 2C Liverpool

The Marine Engineer.

LONDON, FEBRUARY 1, 1899.

THE successful launch of the *Oceanic* has again given Messrs. Harland & Wolff the world's record in the longest and largest vessel afloat. Her length over all, 705 ft. 6 in., is 13½ ft. longer than the *Great Eastern*, but as her beam of 68 ft. is some 15 ft. less than that of the *Great Eastern*, her displacement tonnage is about the same—28,500 tons. The weight of hull, however, of the *Oceanic*, which was about 11,000 tons on the stocks, with only the propeller shafts and propellers on board, is quite exceptional for her size, and considerably exceeds that of the *Great Eastern*, which was reputed as only about 8,000 tons. This special weight of the *Oceanic* is due to exceptional features for rigidity in her hull. All her seven decks are steel plated throughout, giving great transverse strength to her as a girder, for although the orlop deck only extends over the forward part of the vessel and the boat deck does not run the whole length of the ship, but only over the middle portion, the other five decks extend throughout the length of the ship. The upper deck stringers and the bilge plates are double, with two long bilge keels 18 in. deep, the whole bottom is cellular, and extends right up into the fore and after peaks, and the keel design is unusually strong and weighty. Messrs. Harland & Wolff have always been the champions of great ratio of length to beam, and have held to this opinion all through the late revulsion towards "beamier" boats, which was chiefly supported by Messrs. Thomson's efforts. The *Oceanic* has a ratio of 10·07 to 1, which is a greater ratio than exists amongst any of the crack liners except the *Britannic*, which earned for herself the title of "as regular as a train." It is evidently to vie with and even eclipse this reputation that the *Oceanic* has been designed and built for. So far as the intentions of the owners can be anticipated it is not intended that the *Oceanic* shall be a mere record-breaker as regards speed. It is said that she is not intended to steam more than 20 knots as an average to fulfil her allotted task of arriving in New York or Liverpool punctually in the early morning of Wednesday, having left the other side on the previous Wednesday, but she will have a knot or two in hand to make up any unforeseen delay, so that she may always be relied upon to be up to time. We heartily congratulate the White Star Line upon the firm continuance of this business-like policy. The comfort of the passengers will be immensely enhanced thereby. We know of nothing more irritating to passengers than to arrive either unduly before or after an expected time. Friends intending to meet arrivals, arrangements made for prolongation of the journey after arrival in port may be equally upset by too early arrival as by too late a one. Nothing either is gained to the comfort or even business advantage of passengers by arrival in the dead of night in advance of an expected arrival the following morning. The filling also of a hull to her utmost capacity with engines and coal, and the driving of those engines at their utmost speed of revolutions, to shorten a journey of a week by a few hours or even by a day, means racket and hurry and a possible breakdown through over-strain, or a collision through cutting things too fine without any compensating advantage to the passenger. The mere wear and tear upon the nerves in a light hull, vibrating intensely under the heavy strain of engines forced to their highest speed and power, takes, in our opinion, all the pleasure out of an ocean or even a cross-Channel trip. Give us a large, roomy and comfortable boat, as steady as a rock, and in which we don't know that the engines are revolving at all, and the owners are welcome to a fair margin of time if they will observe punctuality in the fulfilment of their advertised time. Beyond all this the *Oceanic* will be an undoubted dividend-earning vessel, with her large cargo and passenger accommodation and her comparatively moderate consumption of fuel for her tonnage. In bad weather she will be the most comfortable and reliable liner afloat, and will easily outdistance those of her rivals in bad weather, which in calm weather might have an advantage of a knot of speed over her. We trust she will be only the forerunner of many other liners to be built on the same sound and commercial principles. We cannot close without congratulations to the builders, to Mr. Pirrie in particular, for the bold and ingenious arrangements of the travelling gantry for carrying out the hydraulic riveting of the steel rivets throughout the hull, and also for the extremely successful and novel arrangement of the launching ways and of the launch itself. With a vessel of such gigantic mass, difficulty in launching might have been anticipated, and even condoned, but as it was the launch was perfect and successful. So we can only express a wish will prove to be the after career of the *Oceanic*.

A VERY interesting and quasi-historical paper has been read before the Shipmasters' Society, London, by Edward Blackmore, master mariner. This paper sets forth very clearly and simply the history of the formation of such shipmasters' societies as are a present in existence, describing their constitutions and the objects they seek to fulfil. The senior society appears to be the Mercantile Marine Service Association or the M.M.S.A. of Liverpool, and their articles include the promotion of the condition and interests of masters, officers, and men, of the British merchant service, the better education of its members, and the provision of aid in case of sickness, death, or legal enquiry. Right well does this Association maintain the traditions of its articles, and by reason of a very handsome accumulated fund, pensions are liberally provided for British seamen, who have sailed from the port of Liverpool, where required and deserved. The next in seniority is the British Shipmasters' and Officers' Protection Society, whose head-quarters is at Sunderland, with branches on the Tyne and the Tees. The articles were based upon those of the Shipmasters' Society of London, which, although not in existence quite so early as the Sunderland Society, was registered before it. A special point in the articles of both these societies is to watch the progress of Bills in Parliament affecting the interests of the members, and to take action thereon if required, besides the usual articles for mutual protection, legal assistance, and relief of widows and orphans. Appeals carried out by this society from the judgments of ordinary courts of enquiry into casualties have been actively prosecuted, and with great success. The other societies referred to by this paper are British Shipmasters' Association of Hull, the Shipmasters' Society of London, this society being brought into being chiefly consequent upon a glaring miscarriage of justice in the imprisonment of the captain of the *Locksley Hall* by a Thames police magistrate, the captain being afterwards unconditionally released by the Home Secretary. After these come the Royal Alfred Aged Merchant Seamen's Institution, providing a home or a pension to British seamen. Next is the Scottish Shipmasters' Association, Limited, having offices at Glasgow, Leith, Dundee, and Aberdeen, and finally what is apparently considered a mushroom growth—viz., the Merchant Service Guild of Liverpool, which, however, arrogates the *rôle* that it will some day absorb the rest. The federation of the chief of the before-mentioned societies in the year 1890 to enable shipowners and masters to make head against the tyrannous pretensions of the Seamen's Trade Unions, headed by Mr. Wilson, is not forgotten by the author, and we should imagine not forgotten by Mr. Wilson and his subordinates.

A MEMBER of the North-East Coast Institution of Shipbuilders and Engineers (Mr. Archibald Hogg) gave to the institution, at its meeting on the 21st of January, his criticisms upon the Board of Trade freeboard tables by comparison with actual freeboards calculated from certain examples of flush deck steamers, so that all should have a constant margin of reserve buoyancy—viz., 28·6 per cent., and shows that the result from the freeboard tables as compared with the constant reserve percentage of buoyancy, differ by as much as 6 in. and 7 in. in two instances and from 3 in. to 4 in. on the average. It would appear, therefore, that the Board of Trade tables are not all that could be wished, and the author suggests a form of freeboard table dependent only on the depth moulded amidships less half rise of floor, and upon the length. This would fix definitely the draught for flush-deck steamers, and in an exceedingly simple manner, provided the mean sheer was at least as per rule, and not beyond the limit allowed, *i.e.*, one-half times the rule sheer. The freeboard being fixed, whether at the minimum draught or less, the scantlings should be made to suit, *i.e.*, regulated according to the displacement and the distribution of displacement. A fine steamer would be expected to have lighter scantlings than a full one of the same dimensions; her floor-plates would be reduced in thickness nearer amidships, and so on. The suggestions of this paper are well worth the attention of shipbuilders and naval architects, and of the Board of Trade.

MARINE ENGINEERS will also be interested in the views on works' organisation contributed to the same institution by Mr. Tom Westgarth. The author first points out the advantage that works should be laid out with particular regard to the kind of work to be done, and also to the size of such work. He believes in specialisation of work for profit rather than an attempt at too varied a manufacture. In his opinion it is wise for engine-builders not to attempt the building of auxiliary appliances, such as pumps or donkey-engines, and probably not even to make their own castings. The experience of the best Scotch engine-builders has shown the wisdom of buying castings and even forgings, as few engine works can keep a forge or foundry in such full work as will make it a paying department. As to the position of tools, it is suggested that it is better that they should be placed according to the rotation of work, so that the progress of heavy parts should be continuous, rather than group all tools of a kind together. A most important department is the hand-tool store, which should be in a central position and carefully organised with a staff for making special tools, gauges, and templates, keep tools in repair, and issue and keep a record of the working drawings. The author also believes in a well-manned staff both in the drawing office, the commercial office, and the cost-keeping department, as most conducive in the long run to economy. Abstract of costs should be issued weekly to the responsible managers. The author impresses also the fact that duplicate work off the same patterns can probably be done 10 per cent. cheaper if put in hand simultaneously, and that such saving in cost will more than amply repay any lock-up in capital by putting work forward for completion before absolutely wanted, if such course serves to duplicate work in hand. It is suggested that if premium apprentices were more carefully trained, even at smaller premiums than is usual, and obliged to abide more rigorously to the rules of the works, it would be to the advantage both of the pupils and the employers, as he believes a class of excellent foremen might in course of time be formed from such premium apprentices. He suggests also partial payment by results throughout the whole of the staff, from managers to workmen, as being the best way to stimulate best production at greatest economy, and a most hopeful means by which we shall be enabled to hold our ground against foreign competition.

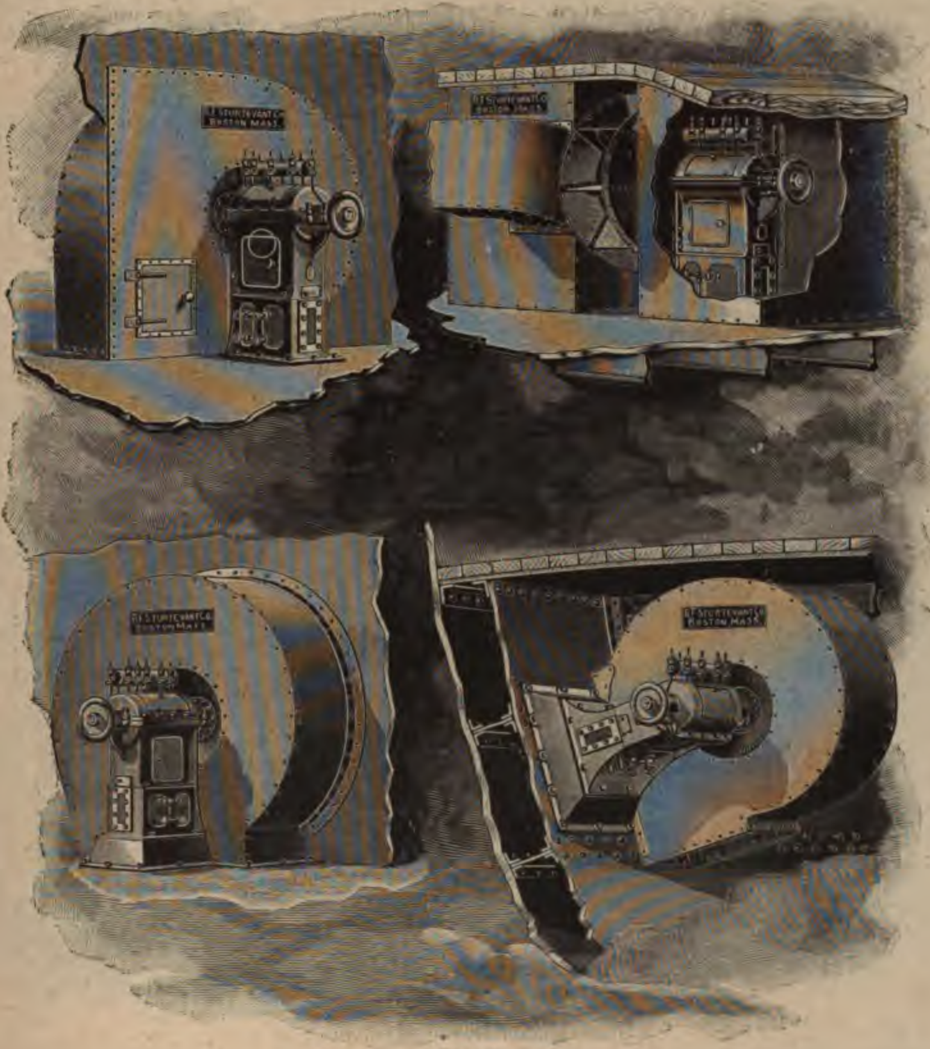


Fig. 1.

MECHANICAL DRAUGHT.

THE high duty per unit of weight and unit of space that is now obtained, both in the naval and mercantile navies, is very largely due to the use of mechanical draught, and although in these days great improvements have been made in the design of the engines by which great reduction in weight and increase of efficiency obtain, still there is no doubt that the greatest saving in weight per I.H.P. is due to the introduction of mechanical draught. Leaving out the ordinary steam-jet in the chimney, which is hardly mechanical, there are three systems of mechanical draught which have been put into practice—viz., the closed ash-pit system, the closed fire-room system, and the induced system.

We have now the opportunity of placing before our readers illustrations of some of the various types of mechanical draught appliances which have been installed by the B. F. Sturtevant Co., of Boston, Mass., U.S.A., whose European house is the Sturtevant

Engineering Co., 75, Queen Victoria Street, London, E.C.

Figs. 1 and 2 represent types of the Sturtevant special steam fans which have been applied for forced draught on vessels of the U.S. navy. Up to the present this firm have installed nearly 400 fans for various uses in over 50 vessels of the U.S. navy, and from extensive records of performance it is shown that on an average the H.P. required to drive the fans is only about ·88 per cent. of the mean I.H.P. of all the machinery.

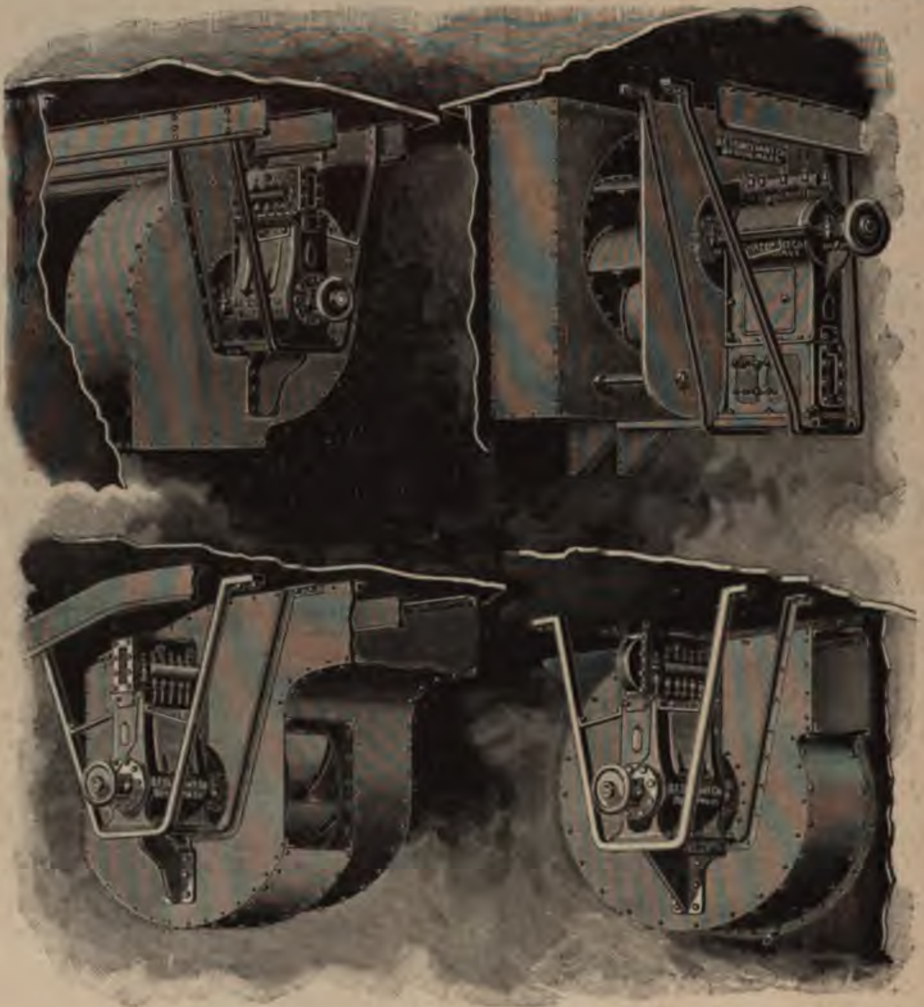


Fig. 2.

Fig. 3 shows the application of the Sturtevant fan to the Kafer's closed ash-pit system of forced draught as fitted to the U.S. S. *Swatara*. The fans are two in number, each having a diameter of 50 in. and width 24 in. Each fan is driven by a direct connected 5 in. × 5 in. double-enclosed upright engine. When running at about 580 revolutions per min. these fans gave an air pressure in the ash-pit of 4 in. of water.

Fig. 4 shows an illustration of the induced draught plant on Ellis & Eaves' system with a Sturtevant fan, as installed at the American Line Pier 14, of the International Navigation Co., New York. This is a system that has been developed by Messrs. John Browne & Co., Limited, of Sheffield, and is a combination of four old principles: 1st, induced draught; 2nd, "Serve" tubes; 3rd, retarders in tubes; 4th the air heated by the waste gases.

The object is to burn, with safety and economy, a much larger quantity of coal than has hitherto been done in a boiler of a given size; consequently, to produce the power required with less boiler space, weight, and even first cost, without the troubles which frequently have accompanied forced draught. Very high rates of combustion have been rendered possible by the absorption of the heat of the gases before they reach the fans. When burning as much as 60 lbs. per square foot of grate the temperature of the gases entering the fans has only been 450°Fahr.

In Fig. 5, we show one of the Sturtevant special steel-plate fans for the forced draught on the s.s. *St. Louis* and *St. Paul*, of the American Line International Navigation Co. The Howden system of forced draught has been adopted in these ships, which, as is generally known, consists of fans which draw the air from the top of the stokeholds, force it through tubes in the uptakes of the boilers, and pass it to the casing or chamber protruding from the boiler-front, which is in communication with the fire-door and ash-pit. We gave a description and illustration of one of these boilers in our issue of September, 1895. The chief advantages claimed for this system are (1st) increase of power, (2nd) economy in fuel, (3rd) reduced wear and tear of boilers, (4th) coolness in stokeholds, (5th) reduced size and weight of boilers for a given power, and (6th) simplicity. It is stated that in ordinary merchant steamers from 40 to 60 per cent. increase of power is obtained, and from 16 to 19 I.H.P. per sq. ft. of fire-grate.

Although there are instances in which induced draught has been adopted in recent years on war ships, the fact remains that the closed stokehold is the system generally adopted, but its existence is, in fact, largely due to the exigencies of modern naval warfare. It lends itself admirably to the necessity of vessels in actual warfare, for it is necessary that the openings down to the engine and boiler space should be kept as small as possible, and in any case the machinery department would be closed down and the air supplied by artificial means during an engagement. Fans installed upon the closed fire-room principle can be easily arranged to ventilate the engine and fire-rooms as well as to increase the rate of combustion. They thus perform a double duty, and avoid the use of a second set of fan gear were this arrangement inadmissible.

The conditions existing in the naval marine are, however, decidedly different from those in the merchant service. In the case of the warship its maximum steaming capacity is seldom demanded, and then only for a short time comparatively, as during an engagement. Consequently mechanical draught, as applied to vessels of this class, is mainly auxiliary in its character; but, nevertheless, a practical necessity. By its employment it is possible to construct the machinery within the limits of space and weight, which are sufficient for ordinary service, while the reserve of power is stored in the light fans and fittings instead of in cumbrous boilers and machinery. In this fact is summarized one of the most important advantages of mechanical draught for marine purposes.

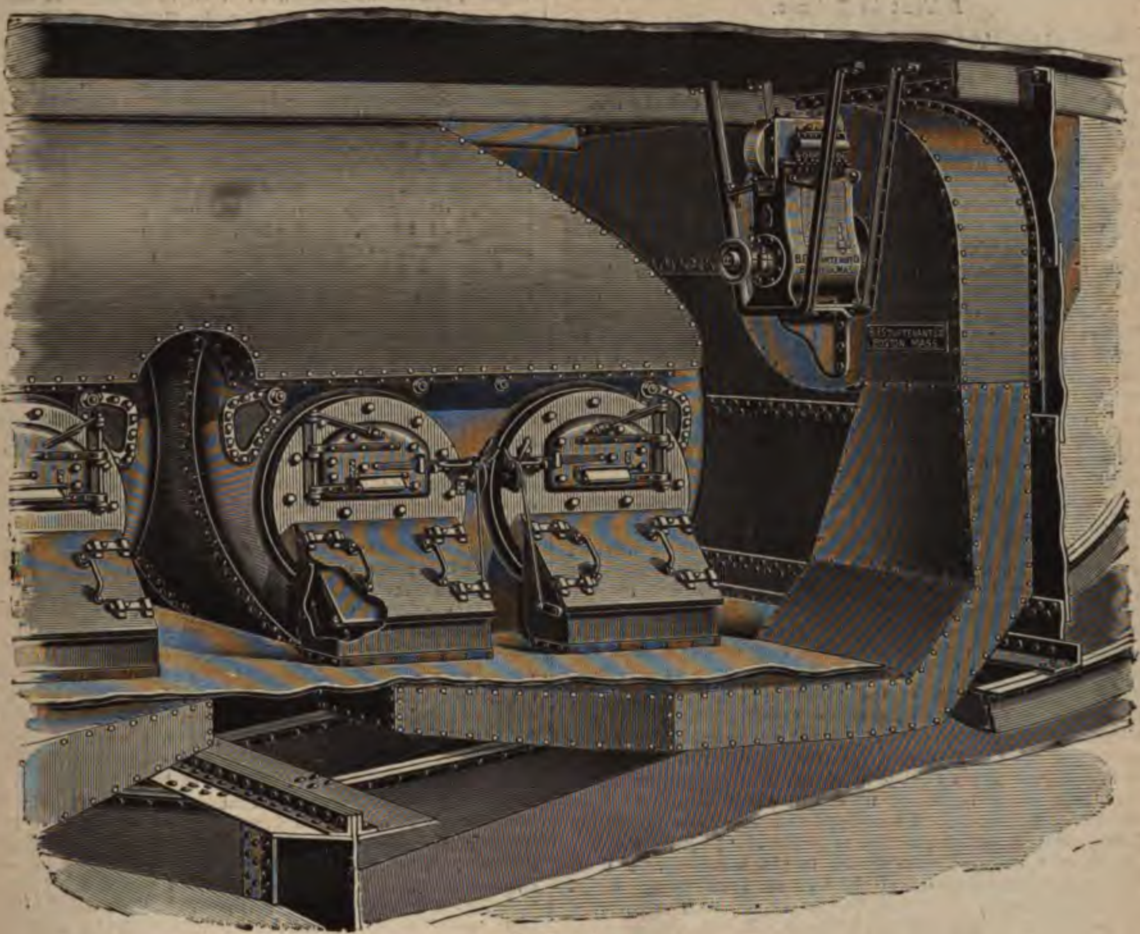


Fig. 2.

Advice has been received of the safe arrival at Pola of the two first-class torpedo-boats, *Cobra* and *Boa*, which left the Thames the end of last year.

THE FLEETS OF THE MAIL LINES.

(From our own Correspondent.)

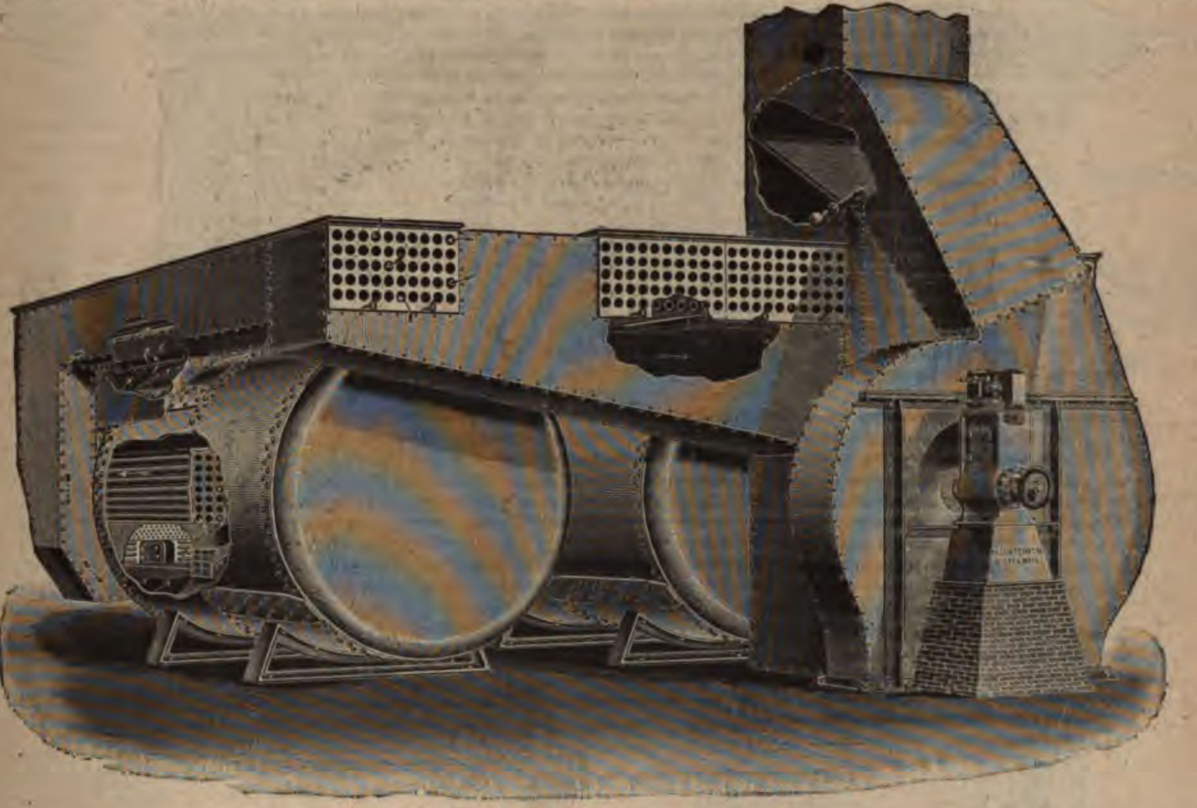
Misprints.

I have to call attention—I will not apologise for faults which I have endeavoured by every reasonable means to guard against—to two disgraceful misprints in my last instalment of notes. In one place the printer spoke of the new 12,000 ton White Star steamer *Medic* as *Medica*. I feel almost inclined to give him the credit for a little intelligence, and perhaps some malice, and suppose that he wanted to make a ghastly and cheap joke out of his work. In another place where I spoke of the Union Company's steamer *German*, the name was printed *Germanic*. In both these cases, however, one has the consolation of feeling that the errors, annoying as they are to a writer, are so obviously typographical errors that they could mislead no one who was at all conversant with the subjects dealt with in this column.

A Visit to Belfast.

I had the privilege of attending at what has not inaptly, perhaps, been described as the shipbuilding function of the century: I went to the launch of the new *Oceanic*. The occasion, important as was the main object of the journey, gave one the opportunity of seeing something of other matters, and so I chose the Fleetwood route, whereby one leaves London certainly three hours before the Irish mail, but still after business hours. It only means that one dines in the North-Western saloon instead of in London, whilst any danger of reaching Belfast after the event was over was entirely obviated. When Fleetwood was reached at eleven o'clock at night, one was rewarded by finding that the crack steamer of the line, the new twin-screw *Duke of Cornwall*, was appointed for the service. A fine steamer she is, and a pleasant welcome she gave us. The large and brilliantly-lighted saloon had a bright fire burning on the grate, and an appetising supper laid which made one almost sorry one had dined in Warwickshire. There was a pleasant smoking-room, where both the marine superintendent, Captain Jackson, and Mr. Gibson, the superintendent engineer, were looking after the general comfort. This apartment was roomier and more comfortable than some I have sat in on board ocean steamers, and there was a main companion that need fear comparison save in point of size with none but the crack Atlantic liners. Downstairs the staterooms offered every luxury, and though the remains of the worst hurricane known for many years (*vide* the report from Browhead), was about, the *Duke of Cornwall's* guests were asleep before they were out of the harbour, and were in Belfast Lough ere the stewards called them for their early breakfasts. Weather is a detail to those who travel by this route. Going up to the Donegall Quay ere daylight, we had our first glance at the heroine of the day—and I take it of many days to follow. Painted for the benefit of the "biographists" that curious colour which for their whole lives the Castle liners affect, the great ship lay on her stocks surrounded by innumerable lights and a busy throng of men who were performing the last duties prior to the great ceremony of the day. Her perfect lines, the strange and weird light, the uncertain distance at which we passed her—all these things combined to deceive the eye in its impressions as to her size, and we felt that she looked more like the model of a great steamer shown in the window of a West End shipping agent's office than the monster that she is. Landing at Donegall quay we found Belfast *en fete*, and apparently every vehicle in the place bound to Queen's Island. Outside the gates was posted a considerable guard of honour. As the yard was approached, the huge gantry and the bows of the vessel seemed to dominate the landscape. Entering the yard the height of the ship and the strengthening of her upper strakes amidships by the round-headed rivets, which are so thickly strewn over her double plating there, was the most conspicuous feature. Then came the view of her run with the two apparently tiny propellers and the trifling rudder, which, nevertheless, with its supports is said to weigh no less than 153 tons. It was at once noticed that aft as well as forward the new *Oceanic* has a rise in her keel so as to facilitate her turning. For the same reason, and also to enable the screws to be brought nearer together, there is a small aperture in the deadwood. But the tips of the blades do not overlap in her as they did in the *Teutonic* and *Majestic*. The built-in methods of carrying the shafting is, of course, continued.

The exceptional length of the new steamship has been a reason why her builders have taken means to give her exceptional longitudinal strength. I have already spoken of the strengthening of her upper works. In the same way—that the girder idea might be completely achieved—the bilges have also been greatly strengthened, so that the lower corners of the beam may be equal to their share of the task of resistance. The vessel, moreover, has no less than five complete steel decks, as well as the partial promenade and boat decks amidships. Even these latter are, in her case, of steel, and are so made a factor in the strengthening of the fabric. Safety, in case of stranding or collision, is provided by the introduction of thirteen transverse bulkheads, as well as a longitudinal bulkhead for a length of 97 ft. in the engine-room, and by the usual double bottom. This is, of course, arranged on the cellular principle. The distance between the two skins is 5 ft. generally, but under the engines and boilers it is increased to 7 ft., and the double skin is carried well forward and aft. The dimensions of the ship are:—Length, over all, 705 ft.; between perpendiculars, 685 ft. Thus she exceeds the *Great Eastern* by 5 ft. in length. In beam, however, she is much inferior. For the leviathan of the fifties was 83 ft. against the 68 ft. of the new vessel. The same may be said of the depth of the two ships. The *Oceanic* is but 49 ft. against the *Great Eastern's* 58 ft. Nevertheless, owing to the improvement in design and to the method in which the full body of the Queen's Island ships is carried further fore and aft than was done in the case of earlier vessels there is not much to chose between the actual displacement of the two when ready for sea. The *Oceanic* has absorbed about 17,000 shell plates, of which those in her midships have been upwards of 28 ft. long each. Some of them contain no less than 900 rivet holes each, whilst it is said no less than 1,700,000 rivets have altogether been used in her construction. The comparison with the *Great Eastern* again shews the progress of forty years. None of the *Great Eastern's* plates exceeded 10 ft. in length, nor 825 lbs. in weight, whilst those of the new vessel weigh up to 3½ tons each. All this means either a saving of weight, or with a similar weight a great increase in strength. But it would have been impossible with the appliances of a former generation to have built a vessel as this has been. For exceptionally large rivets have been used and these could never have been closed by hand power. The great gantry, whose construction took up so much of the twenty-three months that the *Oceanic* has been on the stocks, has enabled the largest plates to be easily and quickly swung into position and has brought the use of mechanical rivetters into the most inaccessible parts of the structure. Speaking of the gantry, which runs on twenty-four wheels, I may say that it will allow the construction of vessels far surpassing even the present ship in size. It is 95 ft. clear in span, and 98 ft. under its horizontal girder. No trouble or expense has been spared in making the ways firm and solid. Piles and concrete had been worked into the foundations, which had already successfully withstood the weight of the P. & O. *China*, and even upon this a floor of new 1½ in. boiler plates had been laid. That no hitch might take place when the order to launch was given, a novel appliance was fitted into the fixed ways. This consisted of a steel bedplate containing an hydraulic ram and trigger, which latter was worked into the sliding ways so as to hold them till the word to let go was given. Then, the water pressure being released, the trigger fell back into a groove and the ways were free to slide under the great weight upon them. The launch was fixed for eleven o'clock—Irish time. Long before that hour the long ranges of seats fixed on the strip of land to the south and west of the slip were filled with guests, and spectators could be seen thronging the rigging of the ships in the docks, the vessels under construction, and every point of vantage in the harbour. The crowd was certainly—according to moderate estimates—at least 50,000 strong. Waiting for the big ship were the familiar tugs *Wrestler* and *Pathfinder*, from the Mersey. As the spectators waited, it was noticed that no platform had been erected at the bows, and indeed no launching ceremony took place. The wives of builder and owner sat with the other spectators. It was pleasant to see that the guests included the wives and families of the White Star staff, afloat and ashore. The presence of these guests and some of their little comments perhaps explained something of the phenomenal success which has attended Mr. Ismay's enterprises. He has the faculty of making every one, who is brought into connection with him, love and respect him. Punctually to the time appointed the firing of rockets began, and a red flag with the words "Launch" upon it was unfurled from the taffrail. Then came the cry, "She's moving." Slowly and imperceptibly she started. Steadily she gained speed. Soon the water covered the lower blades of her propellers, and these began to turn with the pressure. A heavy wave suddenly swept the quay, and as suddenly retired. A geat sound of breaking ropes was heard as the festooned cables were freed by the parting of the hempen ropes which bound them into knots, and in less time than it takes to read this sentence, the vast ship was stopped within her length of the ways, and the event was over, completely and absolutely successful. The big vessel rode without any list to either side, and the guests began to make their way homeward, or went to view the spacious works which were then for the day thrown open to them. I made my way to the Belfast and County Down station, as I wished to catch the Newcastle express, so as to see the SlieveDonard Hotel and the golf links there. As one hurried past the basin one had opportunity to notice the two 12,000 tonners *Afric* and *Medic*, lying side by side, completing for sea, and one then remembered that that day (and now) there is 41,000 tons of shipping completing for sea in Messrs. Harland & Wolff's yard for the White Star Line. There is also at least another 12,000 tons in the *Persic* (if there be no other craft building), preparing for launch. The fleet in active service at the moment amounts to 122,856 tons, excluding the old *Adriatic*, which on the day of the launch of the *Oceanic* set sail from Liverpool for Preston, where she will be dismantled. The coincidence of the launch and of the sailing in question was, to my mind indescribably pathetic. I ran down to the hotel at Newcastle, saw the golf links, and the Mourne mountains, with their snow cap, and wished in vain that I could remain to enjoy the fine air and the comfort, then back in a howling gale to the *Duke of Cornwall*. But I need not have been apprehensive. That good ship had a little pitch, certainly, but never a roll in her. After an inspection of the engine-room and boiler-house with Mr. Gibson, the superintendent engineer of the Lancashire and Yorkshire and L. & N. W. Railways, I turned in, and the next thing was the steward's voice, telling me that we had long been alongside the quay at Fleetwood.



MECHANICAL DRAUGHT. FIG. 4

The immense tonnage of the White Star Line—for considering the class of ship which constitutes it, it is immense—and the fact that all the vessels which have flown the flag have been built at Queen's Island, save the unimportant first holders of the names of *Asiatic* and *Tropic*(whose united tonnage was but 5,304 tons)—has well justified the Belfast Corporation in presenting the freedom of the city to Mr. Ismay. No man ever deserved honour more than he, and no man was ever slower in accepting his deserts.

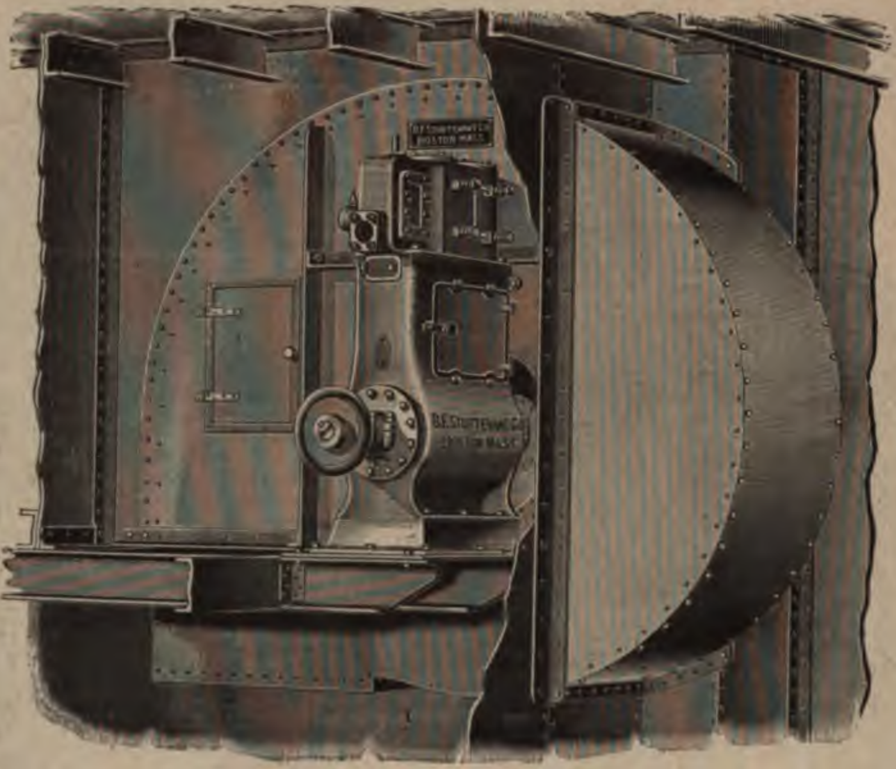
The Channel Service to the Continent.

The recent weather has been severe beyond precedent. Constantly has Dover harbour been unapproachable. Had it not been for the *rapprochement* between the South-Eastern and Chatham Railways, the Continental mails would have been most irregular. As it is, when Dover was impossible, the mails found a convenient refuge in Folkestone. What the trouble really is I don't know. Temporary reasons may be found in the incompletion of the works in Dover harbour. But, to my mind, the solid cause is the adhesion of the railway and other companies concerned in these South-Eastern ports to the obsolete paddle. Paddles were all very well in the older, smaller, and lower-powered vessels. But the day of the paddle is gone, and those who adhere to it will suffer for their out-of-date conservatism. A carefully argued defence of the paddle appear in some recent issues of a French maritime paper. But I make bold to say that all the alleged successful paddlers it names are either summer boats or heavily subsidised mail steamers, neither of which classes are run under commercial conditions. Moreover, when their day is over, vessels built to such requirements find no purchasers, and this consideration should not be lost sight of. In this connection it may be mentioned that the famous little vessels *Samphire*, *Breeze*, and *France*, of the London, Chatham, and Dover Company's Calais Service, have been dismantled at Tilbury and sold to Dutch owners, whilst the *Foam*—one of the remaining small boats, has had her stem badly twisted by contact with the pier at Dover. Captain Bennett, the commodore of the Chatham steamers, who is said to have crossed the Channel thirty thousand times, has just retired. He has been in the Chatham service since its commencement in 1861, when he brought the *Samphire* on to her station. Prior even to that he has been in the service of the South-Eastern Railway on the Channel, and had also run to

Ostend in the miserable vessels which most travellers remember to their cost.

The Transatlantic Passenger Statistics for 1898

are now published. The past year shews up badly generally. There were fewer steamers arriving at New York in 1898 than in any year since 1895. The decrease is nearly 10 per cent. in comparison with 1897. The number of emigrants arriving has, however, shewn up better. The numbers, though 32,000 inferior to those of 1896, are 27,500 better than those of 1897. As might have been expected, in view of the recent Hispano American war, however, there is a decrease of nearly 10,000 passengers in the saloon department. This, on the numbers carried, is about 12 per cent. The Cunard, White Star, and North German Lloyd shew increases, whilst the Hamburg, Thingvalla, and Allan-State shew decreases. The American line's decrease is, of course, explained by the fact that its vessels were doing their country's work in other ways than by carrying passengers in'o the Empire City.



Mechanical Draught. Fig 5

The Admiralty Case

arising out of the disastrous collision between the Transatlantique steamer *La Bourgogne* and the British sailing ship *Cromartyshire*, has at last come to trial in London, after abortive attempts both before the President and before the Court of Appeal, to obtain a decision to the effect that a British Court had no jurisdiction in the matter. When it did come to trial, the result which had all along been expected was reached. The *Cromartyshire* was shown to have been navigated with every care, and to have been travelling at a speed of under four knots when the collision took place. It was the duty, too, of those in charge of a steamship to keep out of a sailing vessel's way. This was obviously not done, and so *La Bourgogne* was held solely to blame. The question of the steamer's speed in this dense fog was of course discussed. On this point it was held, from the evidence of the survivors of her crew, that the officer of the watch had only time to ring down "stand-by" to the engine-room between the first notice of the *Cromartyshire* being in the vicinity, and the crash of collision. Thus at what ever speed the steamship was travelling prior to the collision at that speed was she going at the moment of impact. The evidence drawn from the details of the damage sustained by the sailing vessel, as well as the accounts of the injuries of *La Bourgogne* seem to show conclusively enough, that that speed was too high to be justifiable in so dense a fog as was then prevailing. As far then as our courts are concerned, the *Cromartyshire* is all right. She has, however, been libelled in a United States port by the owners of the sunken steamer, and it may be that another trial will take place in America. Meanwhile the tale of misfortune to the vessels of the Compagnie Generale is unfortunately not yet complete. They have had a misfortune with their steamship *Versailles*, which if total loss be averted, will undoubtedly prove a very expensive matter. The vessel in question was outward bound to Havannah when, after leaving Vera Cruz, she stranded on the rocky coast of Cabanos. The whole of her cargo, coal, and ballast, was discharged, and then a fruitless attempt to float her was made by five tugs. She remained in spite of their efforts firmly grounded for her whole length. The *Versailles* was built at Glasgow in 1882, for the Hamburg American Company, by whom she was some time ago disposed of, and transferred to her present owners. Her tonnage is well over 4,000 gross, and she is by no means the oldest vessel in the fleet to which she now belongs.

A Notable Steamship

was that burnt at Alicante on the 11th January. This was the *Vittoria*, of the Italian Line, La Veloce Navigation Company. At the time of her loss this vessel was bound from Genoa to the Plate with a general cargo and some 400 emigrants. Amongst the cargo was a consignment of sulphur and this seems to have been the cause of the vessel's destruction. Though she got into port and landed her passengers and crew in safety, she herself was a total loss. The vessel is notable as having been one of three very fine sisters built some sixteen years ago by Messrs. R. Napier & Sons, of Glasgow, for a service between Liverpool and Vera Cruz. They were fine steamers of the then large capacity of 4,300 tons gross each. Their hulls were constructed of steel, and they had triple expansion engines, then only just coming into use. They were, however, too good for the trade for which they were built and, their earnings not being commensurate with the cost of working them, they were sold, and for some years have been flying the Italian flag.

A Lesson

as to the risks which the present style of big steamer runs from the possibility of a breakdown of its steam steering-gear in heavy weather, has been shown by the experience of two important cargo vessels since I last wrote for these Notes. The first case was that of the White Star steamer, *Bovic*, which left the Mersey for New York on the 23rd December. She encountered heavy weather, and her steering gear went wrong. The master wisely determined to put about, and on the day when she should have reached Sandy Hook she was reported off Holyhead putting back. Without assistance she came into the Liverpool river, docked, repaired, and resumed her voyage. Somewhat later a similar accident befell the Hamburg-American liner *Alesia*, outward bound to Boston. She, too, encountered heavy weather, and broke down in her steering-gear. In her case also it was deemed advisable to put back. The weather she encountered was perhaps more trying than that which befell the *Bovic*, especially when she was just off the Irish coast. She tried to make Queenstown, and at the first attempt failed, and had to put to sea again for the night. Eventually she made a bargain with two Clyde Shipping Company's tugs to help her into port for the sum of three hundred pounds, and this feat was safely accomplished, in spite of the very heavy wind and sea which was then prevailing.

What would have happened to these ships if they had not had twin screws is not very easy to conjecture. The engines were able to be utilised in relief of the hand-steering gear to a certain extent in both cases. Yet even then a dozen men were necessary to handle the wheel, and the courses followed were still very wild. Moreover, the hand-gear was constantly breaking down and needing repairs, which were naturally very difficult of execution in the heavy sea which was running. With the increase in dimensions of steamships, many of whom now far exceed the dimensions of either of the vessels named, the provision of some duplication of steering power seems a very important want How such provision can be devised, however, must be a very difficult problem to solve.

The Canadian Steamship Company.

I was wrong in stating that the *Fulda* and *Werra* were to go to the Pacific. They have been bought by the new Canadian Atlantic Line, and are to run with the famous *Gaspesia* in the line to Paspebiac. A prospectus of the Company has been privately issued in London. Not content with the purchase of these magnificent steamers—fitted with compound engines—further developments are in contemplation. So a share capital of £150,000 is sought to be raised. This will be divided into £50,000 ordinary, and £100,000 preference, bearing 6 per cent. interest. £200,000 mortgage bonds will also be issued. The fast service with these well-known steamers will commence in March. The *Lucania* and *Kaiser Wilhelm der Grosse* must look to their laurels, as my note book tells me that the *Fulda*—which is quite the faster of the two—did fully 17·8 knots on her trial in the early eighties. At last Canada has a fast service. Meanwhile Messrs. Petersen, Tate & Co., seem to have retired from the competition. I notice too, that a new concern entitled the Tate Steamers Limited, and managed by Messrs. A. Tate & Company, Limited, has been registered. With the avowed object of entering on the business of ship owning. Possibly this has something to do with one of the partners in the firm which was awarded the Canadian Mail contract a while back.

The Freedom of Belfast

is, it is announced, to be conferred upon Mr. Ismay in recognition of the good he and his firm have done for the city by the work which they have placed with Messrs. Harland & Wolff. In this instalment of notes I have already said something as to the magnitude of the fleet. But it may be interesting to recapitulate:—

	Tons.
The fleet in work amounts to	122,856
Completing in the yard	41,000
On the stocks	12,000
Total of present fleet ..	175,856

All this tonnage has been constructed at Queen's Island. In addition to this there has also been built for the firm in tonnage, now no longer under the flag, a further amount of 43,619 tons, so that Belfast has turned out a grand total of 219,475 tons of first-class shipping for the White Star Line in the last thirty years. It would be interesting to work out what this means in wages to the working men of the Northern capital of Ireland. It will be remembered too, that for the last seventeen years the engines as well as the hulls of these ships have been built in the yard, and this means additional benefit to local trade and industry.

The Leyland Line

have just broken the record to Portland, Maine from Liverpool, their steamer *Georgian* arrived at Portland on the 28th Dec., at 10 a.m., having left Liverpool on the 18th of the month. The passage was thus nine and a half days, which surpasses the performance of any record to that part either for her own line, or for any other owners. The *Georgian* was built in 1890 by Messrs. Harland and Wolff, and her tonnage is between 5,000 and 6,000 tons gross.

I may mention here that to replace the *Londonian*, abandoned in mid-Atlantic, the Wilson Furness, Leyland Line have taken over the s.s. *Chicago*, for Messrs. Wilsons, of Hull.

INCANDESCENT BURNERS FOR WORKS PURPOSES.

SEVERAL simple but very efficient designs of anti-vibratory fittings for incandescent gas-burners have been introduced by Messrs. Clay & Walmsley, of Bolton, which possess sufficient resilience to protect the fragile mantles from shock, even in the case of incandescent burners used in workshops and foundries where the vibration would otherwise have proved absolutely fatal to such a system of gas lighting; and

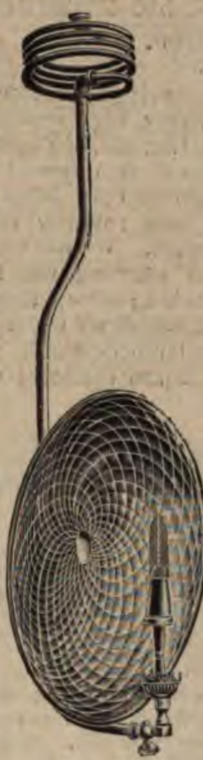


FIG. 1.

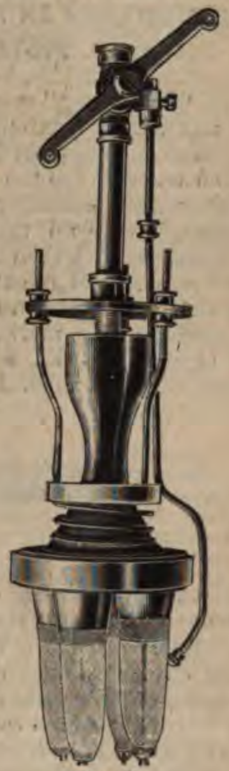


FIG. 2.

we are enabled to give a couple of illustrations showing the application of these anti-vibratory fittings for lights designed for works, and also a further development in the shape of a "floating Bunsen" burner. Our illustration (Fig. 1) shows a suspending No. 4 new burner, with reflector; and, as will be seen, the essential feature of the design consists in coiling the metal gas-pipe itself, by which means a resilient bearing or suspension is effected, which renders innocuous all shocks or vibrations, and maintains the incandescent gas-burner safely in position. Our illustration (Fig. 2) shows an ingenious contrivance in the form of a floating Bunsen burner. As will be seen, in this arrangement four mantles are mounted upon one Bunsen, but it will be readily understood it is only a question of size which regulates a larger or smaller number of lights being mounted in a similar way. All the mantles in this arrangement are supplied from one jet, but in another design several mantles are supplied independently through one body, so that one or more of their number may be used apart from the others. It may be added that the floating Bunsen fitting essentially consists of a wire frame, at the bottom of which is attached a cone, the frame being also provided with sensitive springs, to give the resilient effect.

IMPROVEMENTS IN METALLIC PACKING FOR PISTON RODS.

THE "Lancaster" metallic packing for piston rods has already established a very high reputation, but Messrs. Lancaster & Tonge, Limited, of Pendleton, Manchester, who are the makers of this special form of packing, are evidently determined to keep their productions fully up to date, and recently several improvements have been introduced. We are enabled to give a series of illustrations showing the latest types of metallic piston-rod packing which they are now putting on the market, and which we understand have already secured a very large demand. This packing, of which Figs. 1 and 2 are sectional views along and across the rod respectively, consists of two hollow segmental rings of gun metal, which are filled with anti-friction metal, and are pressed to the rod by circumferential springs. The shape of the segments in each ring is clearly shown in Fig. 2, the parts W being pressed to the rod, while the parts W' do not touch the rod, but keep the flat joints on each side of the blocks W steam-tight. The chief feature of the packing is the spring Z, which is shown separately in Fig. 3. It is made in two halves, and of square steel wire, the coils of one half being screwed into the spaces of the other at S, just as in a square-threaded screw and nut. By this means the spring can be shortened by merely screwing the two halves into each other to a greater extent, thus making it tighter when put on the outside of the blocks (see Fig. 2), the two ends of the spring being then hooked together as at H. Compensation for wear is by this arrangement obtained without any additional complication, and the number of parts in the packing is reduced to the minimum. It will be noted that the spring is close-lapped, except where the halves screw into each other, thus practically doubling its elasticity as compared with an open spring of similar length, and the washer X (Fig. 1), against which the end springs press, in order to keep the transverse joints tight, is provided with an internal rim to prevent the springs accidentally coming into contact with the rod and marking it. Figs. 4 and 5 show the "Lancaster" packing adapted to smaller rods and for rods working in liquids. The blocks A and B are cut like those in the ordinary packing, as shown in cross section (Fig. 5), but are made conical on the outside, and the space behind them filled up with soft metallic packing. By tightening the gland C as for ordinary packing the metallic blocks are thus pressed to the rod, and as the flat joints between the blocks are made quite true they remain perfectly

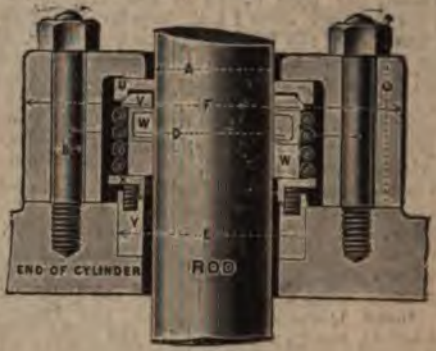


Fig. 1.

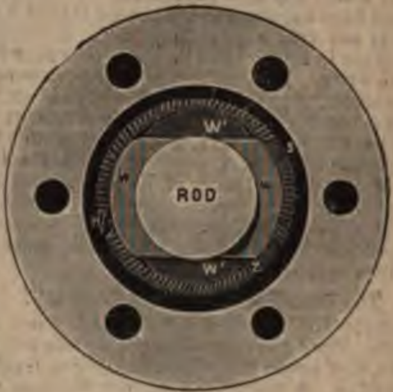


Fig. 2.

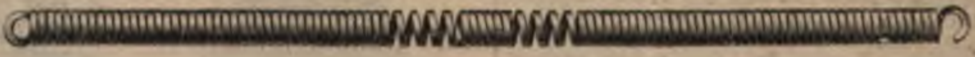


Fig. 3.

steam-tight, as they close on the rod to compensate for wear. For air-pump rods the space behind the blocks is filled with rubber, which is found to prevent the slightest air leakage, whilst at the same time pressing the blocks very evenly to the rod.

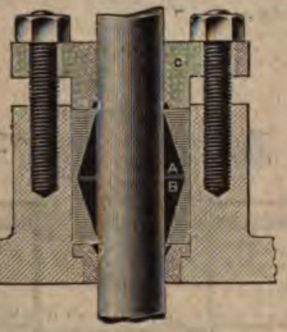


Fig. 4.

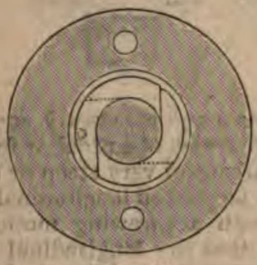


Fig. 5.

For marine purposes the above types of packing are combined in one packing box (Fig. 6). The bevelled rings fitted in the box N are placed at the inner end of the stuffing box, while the spring packings W are placed at the outer end, the spring bush Y being interposed between the two sets, and pressing them

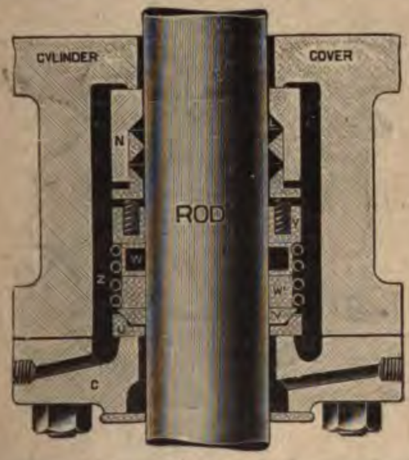


Fig. 6.

against each end of the packing box, thus isolating the latter from both the cylinder and the atmosphere. Some leakage takes place past the top packings, and a relief valve is fitted at C so as to automatically drain the packing box whenever the pressure in it rises above a certain point. The load on the valve is arranged so that no excessive pressure is put on the back of both sets of packings, but so high as to minimise the leakage from the drain, which is an important point in steamships, as all loss has to be made up in the feed to boilers. We understand that Messrs. Lancaster & Tonge have not only supplied their marine type of packing with highly satisfactory results to a number of the important shipping companies, but they have important orders in hand for both home and foreign Governments.

ELECTRICAL NOTES.

(From our own Correspondent.)

INCANDESCENT lamps give out their light in consequence of the filament having high resisting power and the energy of the current being converted into heat. Mr. W. S. Laycock, of the Victoria Works, Sheffield, uses a special wire of high resisting power for his standard electric heaters for ships' cabins, &c. He has lately improved the construction of the heaters; they are now made of $\frac{1}{4}$ in. steel rod covered with insulating enamel turned in the rod at over 2,000 degrees temperature and is thus protected from any heat to which it may be subjected during its life. The steel rod is of spiral form and the resistance coil is slipped on to the rod. The interior of the heater is lined with asbestos and has an air space at the top. It is provided with a switch by which the first or lowest degree, the second or medium degree, or the third or hottest degree. Among other types of heaters there is one of the portable kind supported by small saddles fitted in a wooden base.

Electric Boats.—So far back as 1838 Professor Jacobi made a successful attempt to run an electric boat. He used first a David and later Grove cells. His boat could carry 12 persons, and its speed was from $1\frac{1}{2}$ miles to 2·7 miles per hour.

Electricity in the French Navy.—Electrical workmen are to join the Navy under a three years' volunteer enlistment agreement, and all candidates will require to pass an examination in theoretical and practical points. The manual tests will consist of three pieces of work to be selected from the groups A B and C. A—(1) To make up a joint in a stranded conductor; (2) splice two conductors together; (3) prepare a wire brush; (4) bevel a brush; (5) restore a brush, the wires of which have been bent. B—(1) Put together a switch; (2) put together a push button; (3) make a fuse; (4) make a terminal; (5) make a socket to fit a 9 in. incandescent lamp. C—(1) Take a Leclanché cell to pieces and set it up again; (2) take a vibrating bell mechanism to pieces and set it up again; (3) to cut a bell or a galvanometer into a given circuit; (4) being provided with a battery, a bell, and a push button, to arrange them properly in circuit.

Accumulators on Board Ships. — The *Electrical Review*, New York, discusses the use of storage batteries at sea. It informs us that electric motors are everywhere displacing the auxiliary engine and in a Russian man-of-war building at Cramp's shipyard electric motors will be employed to the exclusion of the auxiliary steam engine. Risks of break-downs are considered and to minimise these it is proposed to install accumulators of sufficient capacity to operate the search-lights, the turrets and ammunition hoisting motors, and about 100 incandescent lights for five hours. In these times when the weights of steam boiler engines and all machinery are cut down to the lowest figure it would be very ridiculous to make the ship carry a great weight of accumulators which would be lower in efficiency to direct working plant.

Marine Enclosed Arc Lamp.—An electric lamp suitable for wharfs, docks, warehouses, shipyards, with their adjacent ironwork shops, require a strong, compact and durable lamp. It should give plenty of clear white light which will not dazzle the eyes of workmen nor throw heavy shadows in already obscure corners. It should be easily trimmed and require that only at long intervals. The General Electric Company of New York have introduced one for this purpose. It is protected from injury and the weather by a stout casing. The upper or long carbon only requires to be renewed once in 100 hours or 150 hours, the lower carbon after the first run being the unburnt remainder of the upper carbon. The outer globe is cylindrical in shape, of thick glass, and protected from injury by a heavy wire guard. The globe can be lowered by a half-turn of the thumb-screw at the side, and when pushed back in position is automatically and securely locked. The lamp is 28 inches long. It can be carried from place to place and hung by the metal ring at the top. It can be used in a 110 volt circuit and can be adjusted for from 4·5 or 5 amperes. Five amperes is the standard current.

Electricity in the U.S. Navy.—Captain Bradford, chief of the Bureau of Equipment of the Navy Department, is concerned about the repairs and renewals for electrical outfits and supplies for ships. Very few of the officers are familiar with electrical engineering, and they are decreasing in number. But electrical apparatus on shipboard is increasing. The Navy Department officials have recommended that a special corps of men be provided to care for the electrical plants. Captain Bradford in his report considers it advisable to erect at the New York navy yard sufficient appliances for the manufacture of the articles.

Electric Pumps.—A test has been made of an electrically driven Worthington pump. It was driven through a double reduction of machine-cut spur gearing by two 65 alternating current motors. The speed of the motors was 450 revolutions, and that of the pump 45, making a gear ratio of 10 to 1. The normal capacity of the pump was 1,250 gallons per minute, the head 350 feet. The first test was run at constant speed and variable head. The voltage of the motors was kept constant at 220 and the frequency constant at 60 cycles. The head was measured by pressure gauges on the delivery pipes the quantity of water by the plunger displacement, less an allowance of two per cent. for slippage. The total energy sent into the motors was measured by Watt motors, placed in the main circuit. The following table gives the result:—

Volts.	Total Press.	Head.	Pumps.	Motors.	Set.	Power Factors.	Amperes.
220	25	57·5	53·7	82·7	44·4	72·6	63
220	50	11·5	67	86·3	57·8	82	82
220	100	23·1	76·1	88	67	88·5	133
220	1·52	35·0	80·1	86·5	69·3	85·6	198

The second test was run under a constant head at variable speed, the pressure steady at 100 pounds per square inch and voltage 220.

Cycles.	Gallons per min.	Pump.	Motors.	Set.	Power Factors.	Amperes.	Volts.
25	490	72·3	77·4	56	86·5	140	74
40	795	77·5	73·6	64·8	86·8	140	147
50	1,040	78·2	86	67	86	140	187
60	1,350	78	87·3	68	85	140	220

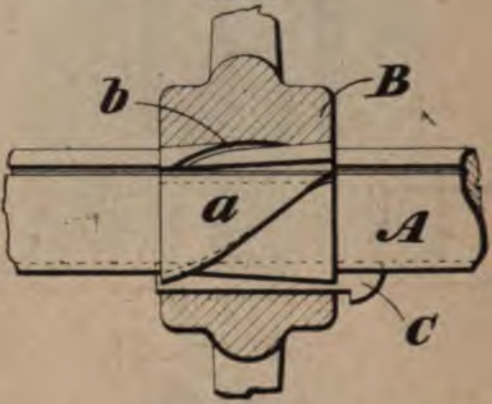
BALLOT'S PATENT PROPELLER AND SHAFT COUPLING.

THE accompanying drawings illustrate a novel system of couplings, the invention of Mr. John Ballot, of 113, Cannon Street, E.C.

The couplings possess several advantages over those of known types, and are adapted for fixing in position driving pulleys, fly-wheels, main shafts, screw propellers, and for many purposes where a coupling is required which is secure in every direction, and at the same time readily attachable and detachable.

Referring to Figs. 1, 2, and 3 of the drawings which shew respectively a sectional side view and end view, and a longitudinal section on line x x, Fig. 2, of an application of the invention to the fixing of a pulley or fly-wheel on a shaft, the shaft A has formed upon it at the place where the pulley or fly-wheel B is to be fixed, three curved or cam-shaped projections a, a, a, each of which extends in a helical longitudinal direction partly round the shaft. The one face of each of these projections is formed radial to the centre of the shaft, while the other face is formed with a curvature which is preferably a circular arc struck from a centre a, slightly eccentric to the centre of the shaft. The boss of the pulley or fly-wheel B is, on the other hand, formed with three correspondingly-shaped grooves or recesses b, extending in the same helical direction.

FIG. 1.



The projections a and recesses b consequently constitute an infinite series of a peculiar form of male and female screw threads of very steep or quick pitch, so that if the shaft be pushed longitudinally into the boss it will pass in with a screwing motion. It will be found, however, that the longitudinal motion can at any point be arrested, if on holding the boss E stationary there be applied more or less suddenly to the shaft a force in the circumferential direction indicated by the arrow Fig. 2; by the application of that force the curved surfaces of the projections a will be firmly jammed or wedged against the corresponding curved surfaces of the recesses b, and the frictional resistance to longitudinal motion produced by such jamming action will, with a sufficiently steep pitch of the helice or screw, be found to be greater than the force tending to produce a longitudinal motion of the boss or shaft by the screw action.

Fig.2.

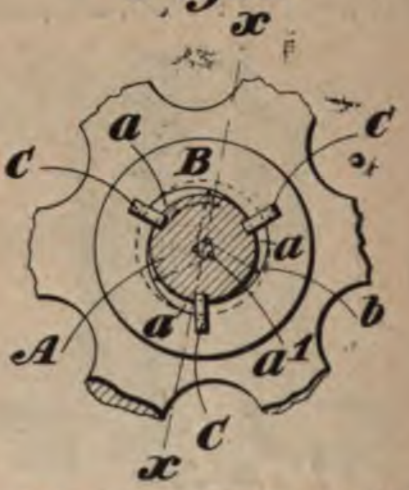


Fig. 3.

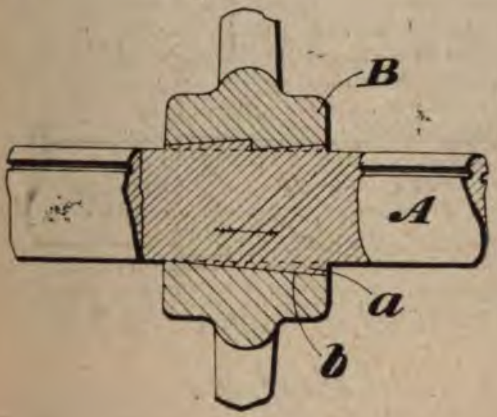


Fig. 4.

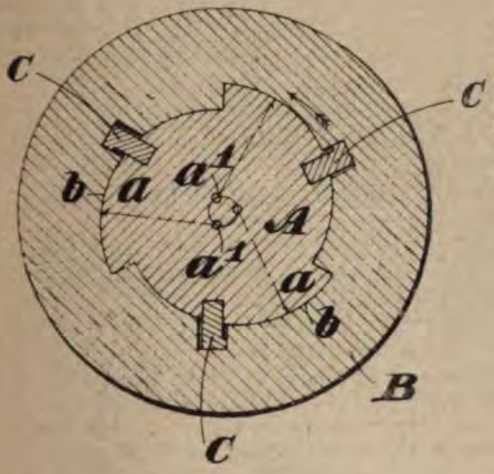
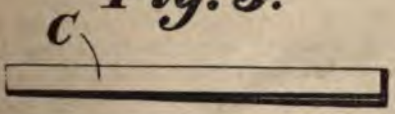


Fig. 5.



Thus, assuming the shaft to have been screwed into the boss of the pulley or fly-wheel until the helical projections of the former are situated entirely within the recesses of the latter, and the one part or the other then have a force applied to it in a circumferential direction, so as to produce the before-mentioned jamming action of the curved surfaces, the pulley or fly-wheel will be firmly fixed on the shaft for transmitting power when rotated by the shaft in that direction. If, on the other hand, a force be applied to the one or the other part in the contrary circumferential direction the jam of the curved surfaces will be released; and as the radial surfaces of projections will then bear against the radial surfaces of the recesses, a screwing action will be produced, causing the pulley to be screwed longitudinally off the shaft. In order, therefore, to enable the coupling to be employed for the transmission of rotary motion in either direction, longitudinal key-ways are formed in the shaft A and in the boss B in such positions that when the curved surfaces of *a* and *b* fit tightly against each other as described, the grooves of *a* will be exactly opposite the grooves of *b*, so that accurately-fitting keys C can be inserted into them. With this arrangement it will be seen that if a force be applied to shaft A in the rotary direction contrary to that of the arrow Fig. 2, any such screwing motion as above referred to will be stopped by the keys C, which will consequently in this case take the strain in the rotary direction. But these keys will not be subject to the total strain thus exerted, for the following reasons:—

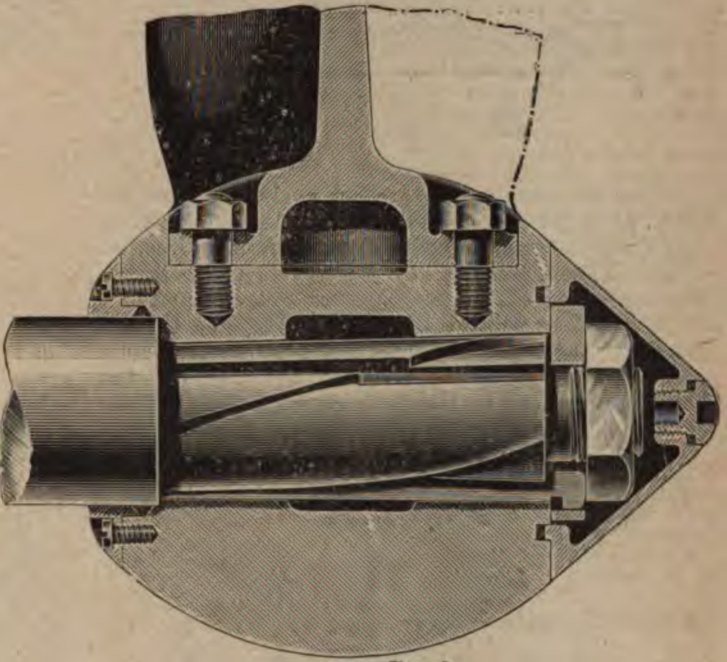
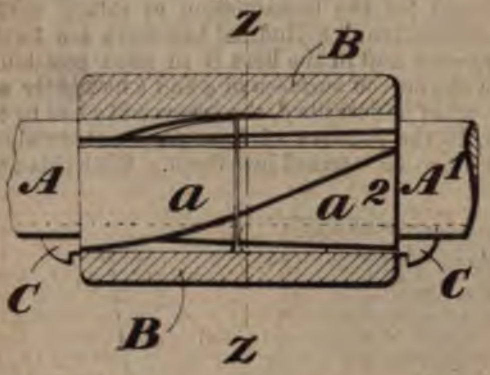


Fig. 6.

Referring to Fig. 3 it will be seen that owing to the helical direction of the projections *a* in combination with the curvature of their surface, a longitudinal section through the axial line will present a taper or wedge shape of the shaft; consequently, as the strain on endeavouring to turn the shaft in the contrary direction to the arrow Fig. 2 will necessarily resolve itself into a longitudinal strain as well as the torsional strain acting against the keys, such longitudinal strain being in the direction of the arrow Fig. 3, will cause the boss B to be wedged tight upon the tapering surfaces of the shaft, thus preventing any longitudinal shifting of the boss in the direction for unscrewing, and at the same time reducing the torsional pressure upon the keys, which can consequently be made much lighter than would be necessary if they had to withstand the entire strain due to the transmission of the power, as is the case with the keys of the ordinary cylindrical shaft couplings.

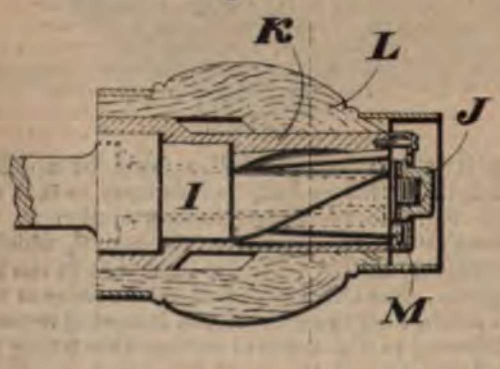
On removing the keys, however, the boss of the pulley is free to slide longitudinally in following the unscrewing motion.

FIG. 7.



When the boss comes against a shoulder on the shaft, as in the case of a screw propeller, the keys are made with a certain amount of taper in the direction of their length, and the key grooves in the boss are made with a corresponding amount of taper, and of a slightly greater width than the taper-key, so that in driving in the keys a circumferential wedging action is produced, tending to jam the curved surfaces of the helical projections with considerable force against the corresponding surfaces of the grooves of the boss, and thus securing the two parts so firmly together by the jamming action that on reversing the torsional strain no material portion of this is exercised on the keys, which simply serve to prevent all relative rotary motion of the two parts in the contrary or unscrewing direction.

Fig. 8.

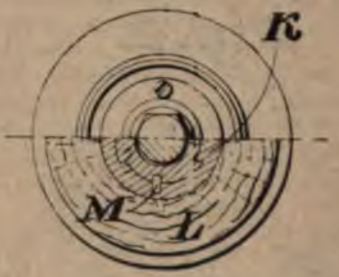


Thus a much firmer and more effectual and reliable coupling of the two parts is effected than is possible with any other known form of coupling.

Although the taper of the keys might be made to *act upon both the boss and* upon the shaft by making the grooves of the latter also taper and wider than the key, I prefer to limit the taper of the grooves of the boss in the manner shewn in the cross section at Fig. 4, where the keys C fit accurately with a non-tapered portion in corresponding grooves cut in the helical projections *a*, while the part in the groove of the recess *b* is formed with a taper ridge, as shewn in the separate view of the key at Fig. 5, and the groove is formed with a corresponding taper and of a greater width than the key, so that on driving in the latter boss B will be forced in the direction of the arrow at Fig. 4, and will thus wedge or jam the recess *b* tightly upon the curved surfaces of the projections *a*.

The application to a propeller boss and shaft is shewn in Fig. 6. In this case a thin nut and a washer are provided on the reduced end of the shaft to retain the keys in position, the hooked heads of the keys being sunk in slots in the washer and the whole covered by a neat cap, which is filled with oil through the plug shewn in the end. Obviously, the coupling would be also very advantageous in cases where two or more propellers are required to be fixed on one shaft.

Fig. 9.



The above-described arrangement with taper keys is also applicable to shaft couplings, such as shewn in longitudinal section at Fig. 7, Fig. 4 being a cross section at *z z* of this figure. The ends of the two shafts A and A^1 are in this case made with the helical projections *a a* running in opposite directions, so that when they are placed end to end their projections will constitute continuous screw-threads. By this means the coupling sleeve B, the recesses of which are formed as correspondingly continuous screw-threads, can, on mounting the shafting, be slid back, say on shaft A, until its end is flush with the end of the shaft, so that shaft A^1 can then be placed in position, after which the sleeve B is slid forward so as to cover the end of A^1, as shewn, and the parts are secured by the taper wedges C, as above described, the abutting ends of the shafts being then jammed together.

Figs. 8 and 9 shew respectively a longitudinal section and a part sectional view of the nave of a road wheel constructed according to the invention, with a view to providing the wheel with ball-bearings in such a manner that the wheel can be removed without disturbing the adjustment of the ball-bearings. For this purpose the usual taper axle has fitted upon it with ball-bearings a sleeve I, which is secured by the nut J on the threaded end of the axle. The outer surface of this sleeve is provided with the helical cam-shaped projections previously described, and the metal bush K, which is fixed in the wooden nave L, is provided with the corresponding helical grooves, so that on screwing this upon the sleeve I and driving in the keys M, the nave will be securely fixed upon the sleeve by the jamming action of the helical projections and recesses as before described.

The couplings may be used also with great advantage for connecting lengths of shafting rods of a diamond drill or other boring tool, as unlike the drill shafts with the usual screw coupling, the drill can be rotated in either direction. In this application it is preferred to provide the forward shaft or rod with a thrust collar at the lower end of the coupling, as in the case of the propeller shaft described, and the keys are secured on a thread of the shaft, also as there described. Further particulars may be had on application to Denne & Simpson, Consulting Engineers, 28, Victoria Street, Westminster, S.W.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The New Krupp Armour.

The trials which have taken place with armour made on the Krupp system have, up to the present time, given excellent results. The system has apparently been adopted in the United States, and at a recent trial there a 12-in. Krupp plate, made by the firm of Messrs. Carnegie, was tested at the Indian Head proving grounds, and the result was satisfactory in every way. All three of the great Sheffield firms are now able to turn out armour plates made on the Krupp system. It will be remembered that during the past year the statement appeared in several papers that the great armour plate manufacturers were unable to supply sufficient armour to keep pace with warship construction. As a matter of fact, there was merely a little delay, and this was caused by the introduction of the new process for making armour plates. The quality of the armour, which is at present being used in warship construction, has been improved by this new process. One result of the improvements has been that the test for plates supplied to the Admiralty has been made more severe than formerly was the case. The Krupp process gives a combination of great toughness together with the hard face which characterises Harveyed armour. It is intended to resist sharp pointed projectiles, and is said to offer increased resistance to punching and rending strains. Generally it may be assumed that the results of the Chino-Japanese and Hispano-American war have had the effect of extending the armour protection of warships. The improved quality of the armour plates which are now being used, has resulted in an increase in the use of thin armour plates, but if, as is advocated, it is intended to mount heavy ordnance on the quick-firing system in their secondary batteries, it will certainly be found necessary to use thicker armour.

Dockyard Work during the past Year.

During the year now terminated an unusually large number of ships have been passed through their speed trials—the *Cæsar*, *Diadem*, *Europa*, *Niobe*, *Argonaut*, *Furious*, *Gladiator*, *Vindictive*, and several cruisers of the *Pelorus* class, and a large amount of new constructive work has been advanced and completed. Of vessels actually launched there are nine on the list: 4 battleships, a first-class cruiser, 2 third-class cruisers, and 2 sloops, totalling 71,090 tons. Two other third-class cruisers, the *Pandora* at Portsmouth, and the *Pioneer* at Chatham, are quite ready for floating, but as the machinery is not ready, and the berths occupied are not required at the moment, they are being kept in the dock or berth rather longer than is usually the case, and wil only be sent afloat when the site they now occupy is actually required for other work. The Royal yacht is also advancing towards the launching stage. The value of the ships launched, not including the cruisers ready but not yet floated, is £4,575,122, but, of course, much yet remains to be done to all the four battleships launched. As a rule, battleships now follow each other in the dockyard slips at intervals of nine months. The year's total falls short of that for 1896, which is the more significant, as that year followed a similarly large output in 1895. The average for the nine years is about 50,000 tons, so that last year and this come up to the "mean," but do not exceed it. The average cost per ton is greater this year than in the preceding years of extensive battleship building. The average cost for 1894 is almost as large, but that is due to cruisers only being included, while in 1896, a battleship year, the average was £6 per ton less. This greater average cost in the year now closing is due to the extra cost of modern armour and modern armament.

French Experiments with Submarine Boats.

Some interesting experiments have recently been carried out with a French submarine torpedo-boat, the *Gustave Zede*. It appears that the trials took place off the Iles d'Hyères, but full particulars have not yet transpired. However, we are informed that, as the result of two attacks on the battleship, *Magenta*, this vessel was struck twice, once at anchor, and again when she was under way. The *Gustave Zede* proceeded from Toulon to Hyères on the surface of the water, the journey being accomplished under the most satisfactory conditions. When at a distance of some two kilometres from the *Magenta*, where she was quite invisible, the submarine boat took the range of her adversary, dived, and proceeded under water until within a distance of about one kilometre. She came to the surface from time to time to make sure that she was on the right course, and when on the surface is said to have presented quite an insignificant target. Two officers are said to have provided the *Gustave Zede* with an "eye," but, of course, this is nothing out of the way, for an American inventor, Mr. Holland, fitted his boat with an apparatus on the camera obscura principle, that is, when the vessel was under water a telescope rose from the submarine ship to the surface, and by an arrangement of prisms a view was obtained of what was going on above.

Portsmouth Dockyard.

There has been an abundance of work during the past month at this yard, and the *London*, which has now been in hand for nearly two months, continues to make good progress, and should the contractors send in material promptly, there is no doubt but that she will hoist the pennant in about eighteen months' time. The record made by Chatham, however, will require a lot of beating, for in the space of twelve months the *Goliath* was launched, the *Irresistible* commenced and put afloat, and the *Venerable* laid down. The *Pandora*, too, continues to make good progress. A most interesting coal consumption trial was carried out here recently with the torpedo-boat destroyer *Flirt* and with a horse-power of only 475, a speed of 13 knots was developed. At a full-power trial held some time back the same vessel developed a speed of 30 knots, with a horse-power of about thirteen and a half times as great. Steaming at 30 knots some seven tons of coal per hour is consumed, but at the trial held a week or so back, one ton of coal lasted for 2½ hours. The *Orlando* cruiser, should have finished her trials after her refit by now, and be out of the dockyard hands. She is intended to relieve the *Narcissus* on the China station, as soon as possible. It may be mentioned that during one of her trials some difficulty was experienced in getting up sufficient steam, but this is put down to the class of men who were responsible for the stoking. The wages' bill at this yard has now reached the sum of £13,000 a week, but during Christmas week it is worthy of mention that it fell as low as £11,000.

Some Trials of Destroyers.

The essays of the various torpedo-boat destroyers which underwent their speed trials during the past year are described in a northern contemporary. In the first fleet of 42 27-knot boats, those by Messrs. White, of Cowes, passed through their trials with about one-tenth of a knot to spare, although the power was somewhat abnormal between 4,800 and 5,070 I.H.P. Fifty-four faster vessels were ordered, including four of 32 knots or more, the *Arab*, from Clydebank; the *Albatross*, from Thornycroft; the *Express*, from Laird; and the *Viper*, from Fairfield. The other 50 were to steam 30 knots, and of these 15 have passed through their trials during the year just closed. 14 succeeded the previous year, and there remain 21 of the 30-knot and the four faster boats still to try, of which five have not yet been launched. The power varied very much. The lowest was with one of Thornycroft's boats, 5.892 I.H.P., which gave almost the highest speed obtained, 30·4 knots; while Vickers, with the *Avon*, about equalled this with 5,986 I.H.P. and 30¼ knots, the sister boat from the Barrow works doing 30·35 knots for 6,412 I.H.P. The highest power was registered in one of Laird's boats, which developed 7,090 I.H.P., and only got a small fraction over 30 knots. Another of the same builder's boats registered 6,848 I.H.P. for 30·16 knots, but a third made 30¼ knots for 6,146 I.H.P. Thornycroft's powers are low; the others, with one or two exceptions, range about 6,000 I.H.P. upwards. The highest speed last year was with the *Ariel*. Thornycroft's boat, 30·6 knots. As to coal consumption, the lowest return was in the case of the *Ariel*, 2·02 lbs., and this was exceptional, and, moreover, extreme accuracy in this respect under the trying conditions is difficult of attainment. Two of the 32-knot boats have had frequent preliminary trials, but none have pulled off their speed. The *Albatross* has done 31¼, with 7,500 I.H.P., and it is hoped 32 knots will be got, but it will probably need more than the assumed 8,000 I.H.P., which means a piston speed of 1,340 ft. per minute, with over 4,000 revolutions per minute.

Speed Trials of Battleships and Cruisers.

Outside of the torpedo-boats, twelve warships passed through their contract trials, one of them only with the cylindrical boilers, the battleship *Illustrious*, the last of her class to be tried. The others had water-tube boilers. There were four cruisers of the *Pelorus* type, all with different types of boilers, and it is not without interest, although far from conclusive to compare the coal consumption results. They were at low power, which is the most extravagant in fuel. They were all of the express type, the idea being to get the high power for the weight. The powers on these trials only varied between 3,627 and 3,643, excepting in the case of the *Pegasus*, with Reed's boilers, developing 3,698; but for all practical purposes the power was the same. The Reed boiler in the Palmer ship consumed only 1·96 lb.; the Thornycroft, made at Devonport, 2·4 lb., the ship and boilers built by Earle, 2·1 lb.; and the Blechynden made by Penn, 2·46 lb. The vessels all exceeded their maximum power, and the speed was satisfactory. There were seven vessels with Belleville boilers, the *Furious* and *Vindictive* being without economizers, and consequently they burned more fuel than the others of the *Diadem* or *Argonaut* class. The Barrow ship *Niobe*, made the best results as regards consumption at all the powers, never exceeding 1¾ lb., and being as low as 1·55 lb. for 75 per cent. of the full power. The coal strike necessitating bad coal to be used in some of the ships, affected the trial results, but three of the vessels of the class averaged less than 1·6 lb. per horse-power per hour on the trial at 75 per cent. of the full-power, and 1·7 lb. on the full-power trial, results which are very satisfactory, in view especially of the other advantages gained from the tubulous boiler.

Devonport Dockyard.

Work on the battleship *Implacable*, which was laid down at this yard on July last, continues at a steady pace, and as soon as she is ready to take the water, which will be in about six weeks' time, the first-class battleship *Bulwark* will take her place on the slip. The latter vessel has been temporarily laid down in an adjacent shed. About 400 tons of material have been bolted together since work was commenced upon her, and she may practically be said to have established a record in the amount of work put into her during her preparatory stage. Orders continue to reach Keyham factory for boilers. A set of water-tube boilers for the *Vestal*, built at Sheerness, has been ordered by the Admiralty, as well as two sets of boilers of the *Normand* type, which are intended for two of the first-class torpedo-boats belonging to the Devonport flotilla. Considerable additions have been made to the boiler-making staff and machinery since the first water-tube boilers intended for the *Proserpine* were made here. Altogether there is a large amount of new work in hand, and it has been proposed that the men go on night overtime in order to hurry it on. Of the vessels refitting here, the *Triumph* is to be completed about the middle of this month. It was intended that she should have been finished earlier, but a great many of the mechanics and labourers employed on her were transferred to the vessels of the Channel Squadron in order to get them ready for sea. A satisfactory trial of the machinery of the *Psyche* was carried out a few weeks ago in Keyham basin, and on the 9th of this month she is to commence a series of steam trials in the Channel. In connection with the trials of the *Niobe*, the Admiralty directed that no assistance should be given by the dockyard officials and mechanics, as has been customary with the trials of new vessels. Their lordships wished to ascertain what results could be obtained with a new crew, unused to the engines and boilers.

United States' Navy.

Some important and exhaustive tests will this year be carried out at the United States' Ordnance Department. The experts have now before them three distinct types of guns, the built-up gun, the wire-wound gun, and Dr. Gatling's new cast-steel gun. It will be remembered that at a recent trial of this gun it came to grief. At a test which is shortly to be carried out, this gun is to fire not less than 300 rounds. Dr. Gatling says that his new 8 in. gun is not a mere casting, but that the interior has been forged by the use of a rotary mandrel, when the gun was red hot, in an annealing furnace. The steel is said to be made much stronger than any other cast material by the alloys used in casting. Although considerable progress has been made in the manufacture of unforged guns, the same may be said of the forged guns, with which pressures of more than 80,000 lbs. have been recorded. The highest pressure recorded with an unforged gun is 49,000 lbs., a pressure which was reached with a 5 in. Hobbs' gun. The question of whether Krupp or Harvey armour shall be used for the new battleships building has also been raised. The Naval Ordnance Bureau are in favour of doing away with the Harveyed armour. Ordnance officials, however, are doubtful whether the Congress will authorize paying a special price for the Krupp armour, as it has recently displayed considerable antagonism to the price paid for the armour made by the Harveyed process.

Chatham Dockyard.

Great activity continues to prevail at this yard, and in proof of this, it may be mentioned that a couple of weeks ago some nineteen vessels were in hand, including those intended for service with the Channel Squadron. Altogether there were more than sixty vessels lying in the basins, the majority of them being ready for sea. The refit of the cruisers *Astrea* and *Forte* has been commenced, and over £7,000 is to be spent upon the later vessel. The refit of the *Astrea* is estimated to cost nearly £9,000. They are to be prepared for a further term of foreign service at the end of March next. It is expected here that in the building programme for the coming financial year provision will be made for a new battleship to be laid down here, as well as for a cruiser. However, there still remains a good deal of work to be done on the *Goliath* and *Irresistible*. The *Venerable*, which has only just been laid down, and which will in all probability be launched in the coming July, and the *Pioneer*, laid down about twelve months since, and which will probably be floated out on the 8th of this month, will give plenty of work to the yard for some time to come. It is believed that provision will also be made in the estimates for the construction of a set of engines for the new cruiser, instead of, as is usual, having them built by outside contractors. An effort is to be made to complete the repairs and alterations of the *Dreadnought*, *Warspite*, and *Mersey* before the present financial year comes to an end. Of the vessels in hand at present, the *Ariadne* was to be ready to proceed to sea at the beginning of this month for a series of steam and gun trials. As an instance of the friendly relations existing between this country and Japan, it is noteworthy that the Japanese battleship *Asama* is to be docked here and examined. This is the second time we have had a Japanese battleship at this yard. It is expected that the new naval barracks will be completed and ready for use in about six months' time.

Contracts for New Warships.

The contracts for seven of the vessels mentioned by Mr. Goschen, in his supplementary programme of July last, have now been placed with various firms. Two battleships are to be built by the Thames Iron Works & Shipbuilding Co., one by Messrs. Laird Bros., and one by the Palmer Iron Shipbuilding Co. They are to displace 14,000 tons, to have an I.H.P. of 19,000, and a speed of 19 knots. The Fairfield Co. are to build a cruiser of 23 knots speed, with a displacement of 14,100, and 30,000 I.H.P.; and three others are to be built at Clydebank (Clydebank Shipbuilding Co.), Messrs. Vickers, Sons & Maxim (Barrow-in-Furness), and Pembroke Dockyard respectively, Messrs. Humphrey, Tennant & Co, supplying the engines for the Government-built cruiser. The contracts have not yet been given out for the twelve torpedo-destroyers, mentioned by Mr. Goschen, nor for the two additional cruisers which are to be built. The cost of the battleships to be built by the Thames Ironworks Co. will exceed £1,000,000, and arrangements have been made by the firm to take over the engineering works of Messrs. J. Penn & Sons. The contract is said to be the largest ever entrusted by the Admiralty to a single firm. The cruisers will be practically armoured *Powerfuls*, 500 ft. in length, and the speed of 23 knots mentioned above is with ordinary draught. The vessels are to have continuous sea speed in smooth water of 21 knots.

Sheerness Dockyard.

The various vessels building and preparing to build at this yard are making plenty of work. Preparations are being actively put forward for the construction of the new sloops *Vestal* and *Shearwater*, which would have been laid down at the beginning of last month, had it not been that some material which was to have been used in their construction had been lost through the foundering of a barge. The sister sloops, *Condor* and *Rosario* are lying in the same basin awaiting their machinery; that for the *Rosario*, which has been constructed at Keyham, being due early this month. The Thames Shipbuilding Co. is to supply the *Condor's* machinery, and has also secured orders to build the machinery for the new sloop *Shearwater*. On the conclusion of the steam trials of the cruiser *Pomona*, this vessel is to be drafted on to the "A" division of the Fleet Reserve. Her trials include one of thirty hours at 3,500 horse-power, to test her coal consumption, and eight hours full power trial under natural draught, when a horse-power of 5,000 will be required, and a forced-draught trial to last four hours, when a horse power of 7,000 will be asked for. Under natural draught her estimated speed is 18·5 knots. Her machinery trial was quite successful. Her engines, it will be remembered, have been supplied by Messrs. J. Penn & Sons of Greenwich. On the completion of the refit of the gunboat, *Partridge*, which it is expected will take place in about three weeks' time, she will be prepared for a further term of foreign service.

Some Naval Promotions.

The promotion of Admiral Sir Nowell Salmon to an Admiral of the Fleet, on the retirement of Sir John Commerell, has led to the promotion of many other officers of the flag list. It is now settled that Sir Frederick Richards is to be an additional Admiral of the Fleet. Therefore, Vice-Admiral Sir William Hotham becomes an Admiral, and Admiral C. S. Cardale, Vice-Admiral, and Captain E. N. Rolfe a Rear-Admiral. Admiral Sir Michael Culme Seymour takes up the post of First and Principal A.D.C. to the Queen, vacated by Sir Nowell Salmon. Other promotions, gazetted a couple of weeks ago, are those of Rear-Admiral C. Drummond, to be Vice-Admiral; Captain Pelham Aldrich, to be Rear-Admiral; Captain Swinton C. Holland, A.D.C., to be Rear-Admiral. Consequent on the promotion of Captain Swinton C. Holland to the rank of Rear-Admiral, the following further promotions have been made: Captains Charles Johstone and John C. Burnell to be Rear-Admirals on the Retired List. The voluntary retirement of Rear-Admiral A. H. Adlington causes Captain A. W. Moore to pass on to the flag-list five months' earlier than might have been expected, as Rear-Admiral H. St. L. B. Palliser will, in the ordinary course of events, retire in June next. He will probably be relieved on the Pacific Station by Rear-Admiral L. A. Beaumont, and Captain R. N. Custance will probably be appointed to the post, which in this case Admiral Beaumont will vacate, of Director of Naval Intelligence.

Pembroke Dockyard.

The Royal yacht continues to employ the greatest number of hands at this yard. Overtime is being resorted to several nights per week, and, if possible, the hull will be completed when the launch takes place, in order that the decorators and joiners, who will be responsible for the ordinary cabin fittings, will be able to put in their work as rapidly as possible. The exact date when she is to leave here has not yet been fixed. Rumour has already given her many names, but those which find the most favour are *Enchantress* and *Balmoral*, the former taking precedence. Nearly all the hands employed on the *Spartiate* have been transferred to the yacht, and the work on the former vessel is therefore practically at a standstill, and it is not expected that she will receive much attention until the Royal yacht has taken the water. Then, of course, she will be pushed forward as rapidly as possible. Work on the new armoured cruiser is to be commenced here almost at once. Although she will be somewhat similar in construction to the vessels of the *Andromeda* class, she will differ from them in some respects. For instance, she will have two thick protective decks instead of one, both decks to be formed of two plates of equal thickness rivetted together. The side armour, we are told, will be fitted against wood backing, and secured to stout frames connected by a double thickness of steel plates half an inch thick, covering the sides between the two decks. In the central part of the ship it is to be 6 in. to 4 in. thick, decreasing to two inches forward.

Naval Gunnery.

Although the question of naval gunnery is persistently and continually coming to the front, interest in it does not seem to suffer in consequence. To shoot straight and accurately should be the ambition of every naval gunner, and, therefore, the opinion of a naval gunner on the subject should be read with interest. The writer asks, in the *Warrant Officers' Journal*, if it is not ridiculous to spend millions of pounds in producing such splendid ships as our squadrons are composed of, and then wickedly economise a few thousands in withholding sufficient practice ammunition from our captains of turrets, of guns, and of barbettes which would help them in such training as will enable them to efficiently use the splendid weapons with which our ships are armed in order to send the enemy's millions to the bottom before he can send ours. If such a policy is being carried out, it certainly is a suicidal one. The report of last year's prize firing from the Mediterranean Squadron are not at all satisfactory. From it we learn that 259 rounds were discharged from the heavy guns with the ship steaming at eight knots, and only 30 per cent. of hits was obtained. Even in the Channel Squadron, we are told, muzzle-loading field guns are still in use. In view, however, of the great attention given by Admiral Ranson to gunnery practice when on the Cape Station, it may be assumed that, now he has taken over the command of the Channel Squadron, a much needed impetus will be given to good shooting. Compared with the record of the American fleet, the report from the Mediterranean station makes poor reading. The *Philadelphia*, for instance, before the late war, put on 90 per cent. of hits, and the average was 70 or 80 per cent. It has been suggested that the marking was done badly on these occasions, but this has not been proved. If the registers *were* accurate, it is a wonderful record, and one which our own gunners should strive to beat.

Opening of the Devonport Sailors' Rest.

On the 26th ult. the Empress Frederick formally opened the new Sailors' Rest at Devonport. There are two "Rests" at Devonport, and some 128,634 sleepers made use of them during the past year. It will be remembered that a few weeks ago the Empress Frederick formally opened another new "Rest" at Portsmouth, a building which contains 120 cabins, workrooms, and other apartments. On this occasion Miss Weston gave a most interesting account of how the work in which she takes so much pride commenced. There is no doubt that these "Rests" are appreciated by every British Seaman, and it is an honour to Miss Weston to know that representatives from the German Navy have visited her institution, and that a similar building is to be erected at Kiel for the benefit of German sailors. The Americans and Japanese have also sent representatives to study the organization of Miss Weston's homes with the idea of erecting similar buildings in their respective countries. The Empress Frederick inspected the Devonport "Rest" on the occasion of the formal opening, being received by Miss Weston and many naval and military officials connected with the yard. Each of these "palaces" for sailors has cost over £100,000 to build and furnish, and at the present time is self-supporting. As an instance of the favour with which they are regarded by sailors, it may be mentioned that over £15,000 was taken over the counters at Devonport last year.

Naval Engineer Promotions.

An unusual state of stagnation in the flow of promotion in the engineers' branch of the Royal Navy is to be noted during the past year. It appears that there was one addition to the rank of chief inspector of machinery, and two officers only were promoted to the rank of inspector of machinery; 17 officers obtained the rank of fleet engineer, a falling-off of nine as compared with the year 1897; 17 chief engineers were promoted to the rank of staff engineer; and 32 engineers were made chief engineers. One of the principal causes of this stagnation is the refusal of the Admiralty to allow staff and fleet engineers to retire before they have reached the maximum age of 55. Many naval engineers are of opinion that, if the Admiralty gave way on this point, it would lead to a considerable improvement in their prospects. The enlargement of Keyham College has not yet resulted in any improvement in the number of assistant engineers who, through the last few years, have shown very little increase. A remedy which has been put forward for that evil is large additions to the junior ranks of naval engineers.

GEIPEL'S ADMIRALTY TYPE STEAM TRAP.

THE tendency of all those navies which are in the vanguard of progress is to use steam of higher pressure. Not many years ago 80 lbs. was the usual pressure, but a very few years ago 150 lbs. was general; now, however, a working pressure of 300 lbs. per square inch is common. With the increase of working pressure the efficient draining of steam pipes and engines becomes more important, for the loss by radiation and conduction increases with the temperature of the steam.

To ensure that there shall be no loss of live steam, it is found that when working with these high pressures the draining valve must be pressed to its seat with great force. Experience has shewn that the displacement of a float has insufficient power to effect this purpose unless the float be abnormally large and the valve-opening abnormally small. These conditions are especially objectionable on shipboard; moreover, there are other objections to the use of float traps for marine purposes.

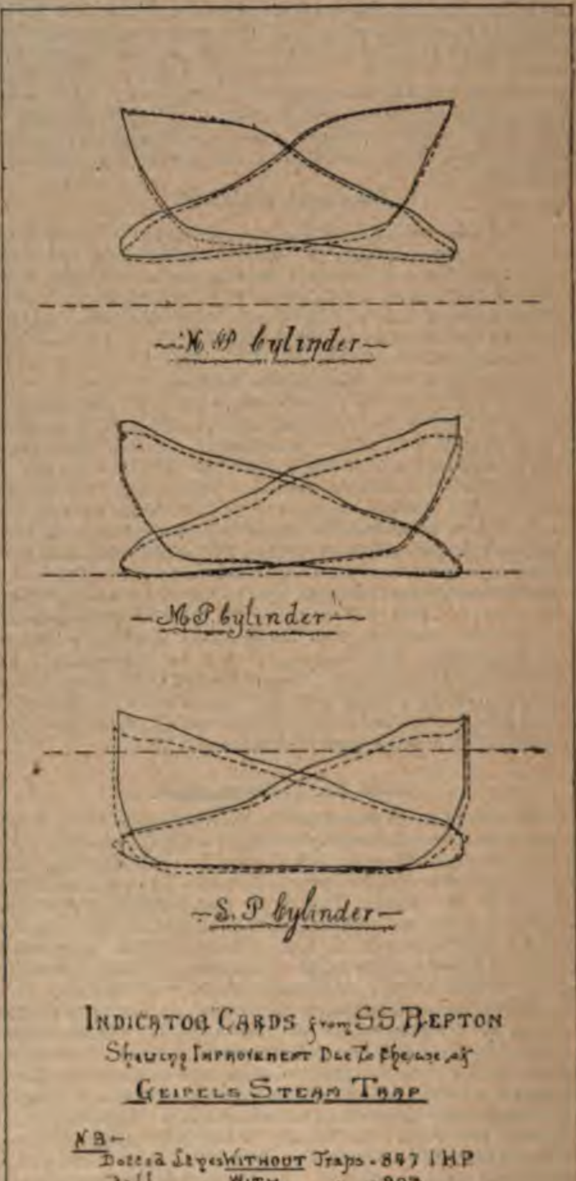
On the other hand, the force set up by the expansion of metals is limited only by the strength thereof, and is, therefore, very great. There have been objections to the use of expansion traps in the past, partly because of the small movement available for opening and closing the valve, and partly because when these traps are adjusted to a given pressure any excess of that pressure causes cutting and straining of the valve, while a fall in pressure opens the valve and lets out live steam.

For usual purposes, and where the variation in pressure is not excessive, the ordinary Geipel trap overcomes these objections. Owing to the triangular arrangement of the two expansion tubes the motion is enormously multiplied. This motion may be expressed algebraically thus:—If x = motion of the apex parallel to the base, a and b = the two sides of the isosceles triangle, and c = the base of the isosceles triangle, then

$$x = \frac{a^2 - b^2}{2c}$$

So that by making c small x becomes great.

In the case of the medium size of Geipel trap, for example, the linear expansion of the brass tube with a temperature of, say, 300°F. above the atmosphere is only 3-1,000ths of an inch, and of the iron tube about one-half of this. This movement, which, as it stands, is far too little to open the valve, is altered from a direction at right angles to the base to one parallel therewith, while it is multiplied about one hundred-fold. Thus the objection of too little movement which is found with expansion traps is overcome. Coming now to variations in pressure, the ordinary Geipel trap is provided with a spring which yields, should the expansion exceed that for which the trap is adjusted, so obviating damage by straining or cutting the valve, and this meets all variations found in usual practice.



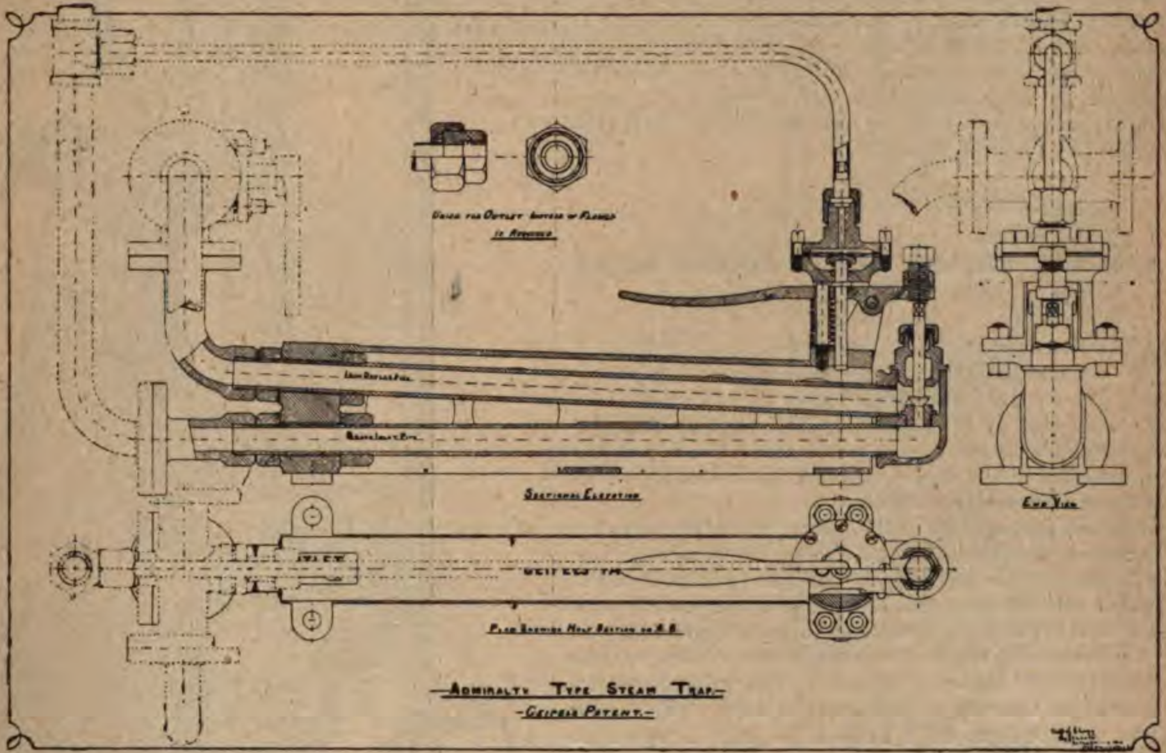
But the English Admiralty require a trap which shall be tight against steam at pressures varying from

300 lbs. down to atmospheric pressure, and at the same time discharge water promptly and as soon as it condenses. In other words, they require a trap which, without adjustment, will hold tight with steam at from, say, 420°F. to 220°F., and yet will discharge water when at 410°F. Their reasons for such requirements may be summed up as follows:—A considerable time is occupied in raising steam, during which it is the custom to open all steam pipes so that the temperature of the whole system may rise gradually and simultaneously, while the working pressure is frequently very much less than the maximum. This might be obtained by readjusting the traps by hand, but on vessels of war the whole of the steam apparatus must be ready in case of emergency to work at the full maximum pressure—there is no time for readjustment of steam traps or any such apparatus; consequently such traps, if adjusted for full pressure, will allow live steam to blow all the time that the pressure is much lower than the maximum.

It would appear at first sight that an expansion trap could not be adapted, owing to the anomalous conditions above mentioned. In his new type of trap Mr. Geipel has, however, entirely overcome the difficulty. To attain this object two forces are used—one due to the difference of temperature causing expansion of the tubes, as before described; the second due to the pressure in the pipes, which controls the adjustment of the trap, and alters it according to the pressure. The arrangement is shewn in the accompanying drawing.

The expansion tubes and valve are the same as in the ordinary type. The lower or brass tube is connected to the steam pipe; the upper or iron tube to the discharge. The valve is at the apex. When the tubes are cold they are contracted; the apex is down and the valve free to open. When steam enters the brass pipe it expands and raises the apex and valve against the stop in the end of the lever. The valve is then closed. When water forms it enters and contracts the brass tube, and the valve is again opened until steam enters, and so on.

The position of the stop in the lever determines at what point the valve shall begin to open, and this is operated by the diaphragm which is subjected to the pressure in the steam pipe or receptacle to be drained. When the pressure is low the stop in the end of the lever is low, and conversely when the pressure is high the stop is raised. The amount of movement allowed is exactly that which is necessary to suit the position which the apex or valve occupies at low and at high pressure. This precise adjustment is obtained by the use of a helical spring against which the diaphragm works. No difficulty has been found in practice in securing this adjustment. As in the ordinary type, this trap may be blown through by hand by pressing down the lever, and there is the same facility for quickly removing the valve, which may be done by simply unscrewing the cover.


Union for Outlet Screwed or Flanged as Required
Sectional Elevation
End View
Plan Showing Half Section on A.B.

—Admiralty Type Steam Trap.—
—Geipel's Patent.—

This new type of trap has been already adopted on a large number of vessels, including H.M. s.s. *Arrogant*, *Furious*, *Perseus*, *Prometheus*, *Salamander*, *Proserpine*, *Vindictive*, *Sheldrake*, *Hyacinth*, *Psyche*, *Bramble*, *Britomart*, *Pelorus*, and various torpedo boats, and the accompanying sketch shews the method of fixing generally adopted on these boats. It will be seen that a three-way cock is provided on the discharge, so that it may be opened to the atmosphere, and the action of the trap may thus be periodically tested without breaking any joint. It has also been tested by the French naval authorities, and has obtained the official approval of the French Minister of Marine.

The importance of the efficient draining of all steam pipes and receptacles requires but little emphasis, whether it be viewed from the standpoint of safety to life and machinery, of economy in fuel, or otherwise. We have before us, however, some interesting diagrams taken from the s.s. *Repton*, on which Geipel traps have been in use for three years. We reproduce them, as they illustrate markedly the improved working of the engines.

It will be seen that the pressure in the intermediate receiver is increased from 44·5 to 55·5 lbs., that is 13·5 per cent.; while that in the low-pressure receiver is increased from 2·5 to 4·5 lbs., that is 80 per cent., the boiler pressure being the same in each case; while the total I.H.P. is increased from 847 to 903.

Full particulars may be obtained from Geipel & Lange, 68, Victoria Street, S.W.

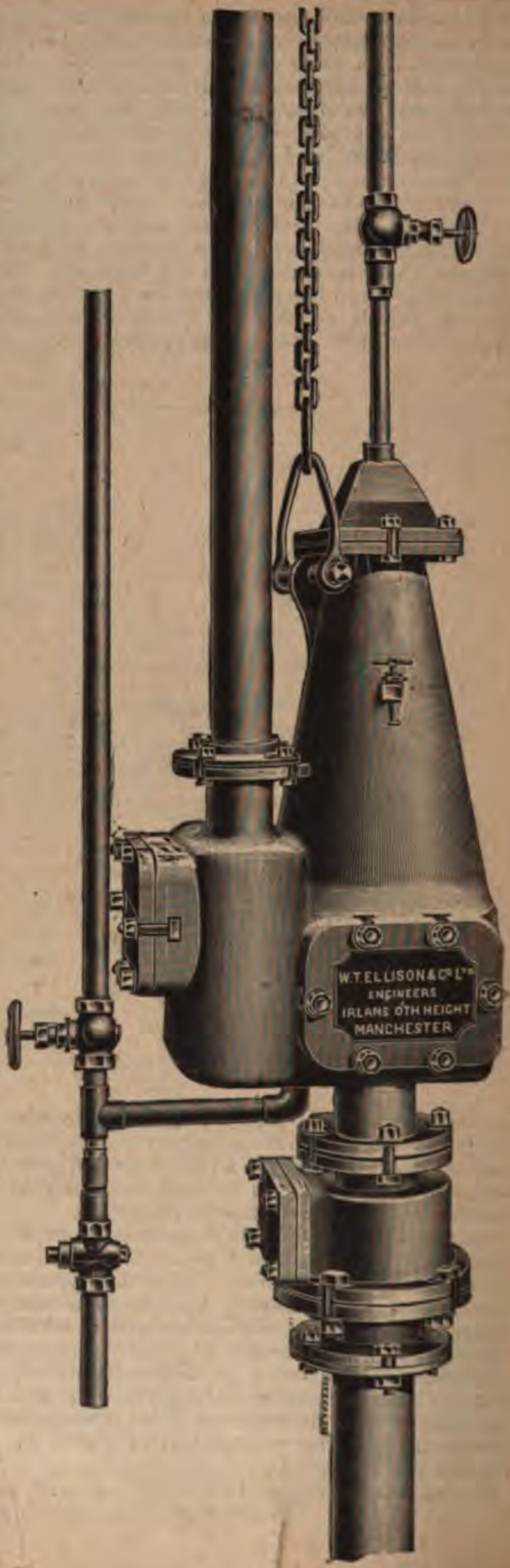
"NIAGARA FALLS" DIRECT-ACTING STEAM PUMP.

WE illustrate in the adjoining diagram a new pump of the pulsating or direct-acting type, which is being put on the market by Messrs. W. T. Ellison & Co., Limited, of Manchester. The special improvements which obtain in this pump mainly refer to the construction of the steam valve, so as to make it work easily and be free from choking.

Instead of the body of the pump being two separate chambers, it consists of one casting, divided into two equal parts by a vertical diaphragm, which is made capable of resisting the steam pressure on the one hand and is made thin enough to permit the water in one chamber to readily condense the steam in the other, so as to create a vacuum. The steam inlet is, as usual, at the top of the device, where an angular valve is mounted on a knife-edge, and adapted to vibrate from side to side.

The central diaphragm extends up into the steam space, which is divided by it. The two steam ports are formed upon angularly-disposed faces, with which the valve co-acts, the latter being Λ-shaped, and is suspended on the apex of the angle. This shape and arrangement of valve allows its centre of gravity to be placed considerably below the point of support, permitting very free movement, and consequently quick action with little force.

The area of the steam ports is large, so that a small movement of the valve admits a large volume of steam. The operation of the device is the same as obtains in all pumps of this type—viz., when the steam has filled one chamber the valve vibrates and closes the inlet to the chamber, opening that of the other. The water is forced out by the pressure of steam, and when finally discharged the steam condenses, and creates a vacuum which the water again fills. There are the usual inlet and outlet valves at the bottom,



but they are constructed so as to permit dirty water being pumped without any danger of choking.

It has been found by actual experiment, we understand, that the steam consumption is less than in the majority of pumps of this type, which is no doubt due to the efficiency and quick action of the steam valve.

THE "RESERVOIR" STEAM TRAP.

We have pleasure in illustrating an ingenious steam trap, which has lately been put upon the market by Messrs. J. Armstrong & Co., Limited, under the title of the "Reservoir" Steam Trap. Referring to the illustration, it will be seen that Fig. 1 is an outside elevation, Fig. 2 a sectional elevation, and Fig. 3 a view showing the device attached to a steam pipe. This trap is controlled by means of an expansible and contractible corrugated chamber, containing a volatile fluid which is adapted to act directly upon the valve controlling the water outlet. On heating this chamber the fluid expands and closes the valve, and on cooling the converse action takes place, and any water present passes and rises into the dome, which is made of copper. This dome, having a considerable radiating surface, acts as a cooling factor for the water contained therein. The delivery of the cooled water from the dome takes place down the vertical pipe to the right hand branch. When the valve is opened and the water is being drained the temperature of the water in the dome gradually rises until a point is reached, when the thermostatic chamber closes the valve, which remains closed until the water in the dome has dropped sufficiently in temperature to again open the valve, and so the cycle of operations is continually repeated as long as any steam is in connection with the trap. The trap shown in the illustration is the smallest pattern made, and is capable of efficiently draining 36 ft. of 6-inch pipe, and will deliver 250 gallons of condensed water per hour. The casting is made of gun-metal, and the dome is of copper, the whole weighing only 1¼ lbs. This is the ½-inch size. The largest size made is a 2-inch trap, capable of passing 3,840 gallons per hour. By means of this trap ships' steam whistles and sirens can be kept free of water and always ready for any emergency. The sole agents are J. Armstrong & Co., Limited, 116, Queen Victoria Street, London, E.C.

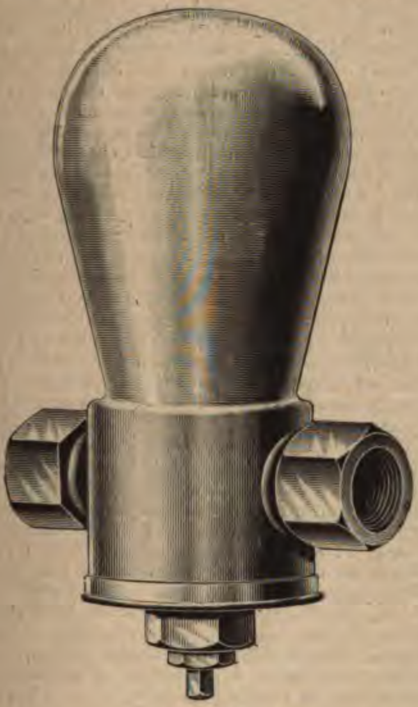


Fig. 1.

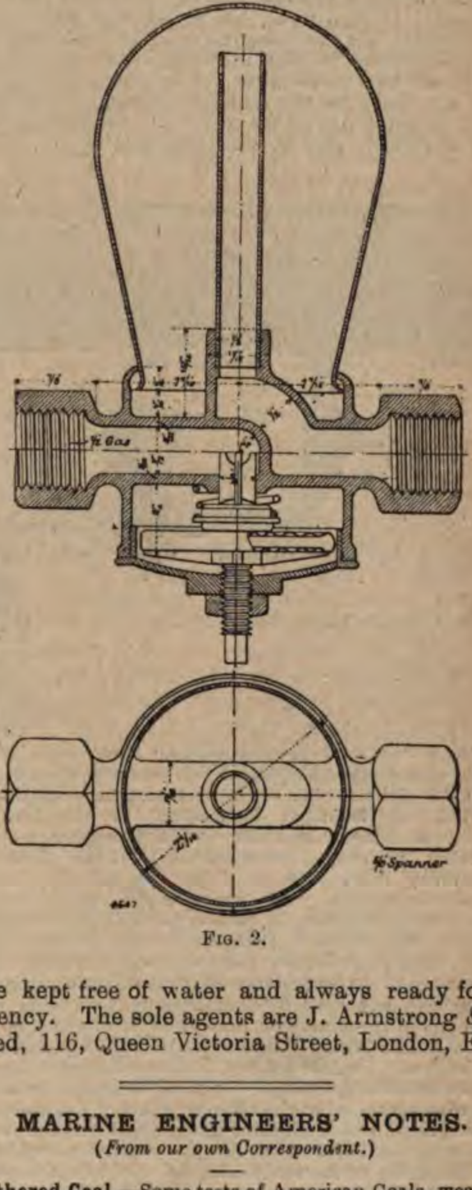


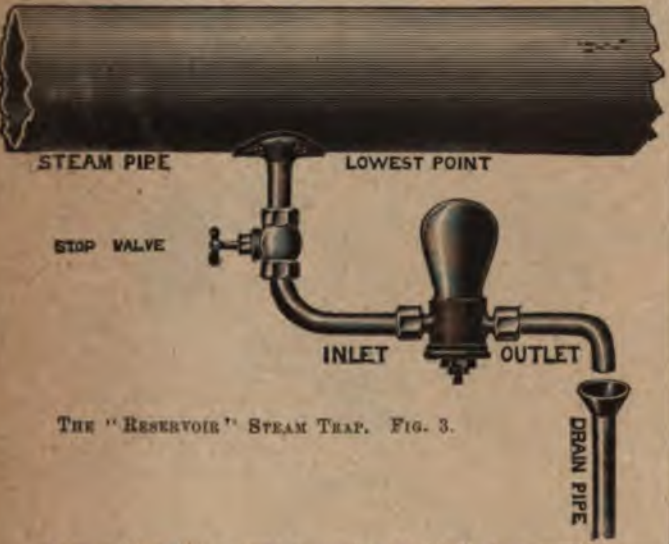
Fig. 2.

MARINE ENGINEERS' NOTES.

(From our own Correspondent.)

Weathered Coal.—Some tests of American Coals, weathered and unweathered, will be of interest to marine engineers, inasmuch as it is well known that weathered coal soon deteriorates. The coals tested were American, and it was shown that the samples of the weathered coal contained less carbon, hydrogen, and nitrogen and more oxygen than the weathered coals. This would appear as if weathering favours slow oxidation. But the results shown in the laboratory were of little difference, and were not in accordance with that found in practice. The difference found by Messrs. Hale and Williams, showed only ·5 per cent., and some other explanation must be sought for the change in the calorific value of coal stored at such places as Aden.

The conversazione of the Institute of Marine Engineers took place at the Stratford Town Hall, on Friday, the 20th inst., when the largest company which has yet assembled came together. A good selection of music was given on the organ, and several good songs were sung. At nine o'clock there was a ball, which continued till three o'clock. One new feature of the conversazione was an exhibition, and Alderman Kidd kindly sent several different types of the Hart secondary storage battery. One of these was for Stone's railway electric lighting set, as used on the London, Tilbury, and Southend Railway. One notable feature of the Hart cell is the joint between two elements. The lug is lead cast, and the bolt which fits into it is also cast. It is a taper, but fits exactly when brought together without the file being used on it. The President's address took place on Monday, at the premises of the Institute instead of at the conversazione, as in former years. This obviated the break in the musical programme, and left the address to be listened to by the members. Sir William White occupied the chair, and he was supported by Mr. Beldam. Among those who were present was Sir Fortescue Flannery, Mr. McFarlane Gray, Alderman Kidd, and Mr. Lawrie. The President, Mr. John Inglis, began by saying he would relegate the subject of technical instruction to the limbo of neglect for a time. And he did not appear to place much faith in any improvement of the industries of the country being derived from that, and he warned the members against "the expectations which may not be realized when that wisdom, whose price is above rubies, is sought for merely as an instrument for the opening of some imaginary strong-box which shall disgorge itself upon us in golden showers." As an instance of great things coming from those who had not been fitted educationally to bring about improvements in machinery or make new inventions, he gave the story of James Watt. "About a twelvemonth ago, at the annual dinner of a kindred society, I was privileged to hear the eulogy of James Watt pronounced by the illustrious Lord Kelvin. We were then reminded of the often-told tale of the jealousy of the trades' guilds, which hindered the young instrument maker from commencing business in his own workshop within the burgh of Glasgow; of the refuge afforded him by the venerable University, and of the work entrusted to him—the repair of a model steam engine belonging to the apparatus room of the Natural Philosophy Class—and of how, while engaged in this work, he was so unfortunate as to conceive the idea of the separate condenser, the first of the long series of contrivances which made James Watt the most famous inventor in ancient or modern times. While listening to the eloquent address of the great philosopher, this somewhat irreverent question would keep intruding itself—why did not the Professor of Natural Philosophy himself invent the separate condenser instead of the young workman from Greenock? James Watt, with all his industry and capacity, cannot have been the equal of the professor in knowledge of physics, and yet, for one person who has heard of his patron, the founder of the Andersonian University, tens of thousands are familiar with the name of the author of the modern steam engine. This brings us back to the proposition already faintly indicated, that we cannot produce to order a genius or an epoch-making invention by any process of culture yet discovered; and it is vain and unprofitable to feel discouraged if such flowers do not always spring up to adorn the fields under our various systems of tillage." Of the Germans Dr. Inglis is not afraid, and he thinks if they are formidable at all as rivals it is due to the habits of discipline acquired by German young men while serving with their regiments. Dr. Inglis, like Rudyard Kipling, thinks much of the heroism of Englishmen in even the lowest grades of employment. "When reading the heartrending accounts of calamities at sea, where the horrors of the scene have been intensified by the dastardly conduct of men, whom it were gross flattery to call brutes, it has been a proud reflection that the records of our mercantile marine, as well as those of our navy, abound with narratives of heroic sacrifice by our seafarers for the safety of the helpless, and that even the so called 'hard cases,' often drunken and sometimes mutinous, have on many occasions gone unostentatiously to death rather than prolong existence by contending with the weaker for the means of escape." He deplores the tendency of the times to shift responsibilities on to the joint stock company. "It is not by Boards of Directors, even though they be of noble lineage and so guileless as not to be able to distinguish a bribe from a legitimate profit, that our position among industrial communities has been won, and it is not by them that it will be maintained. It will be found that when the joint-stock manufacturing company has a great reputation for the excellence of its products, or is a conspicuous financial success, it is dominated by one or two strong men who infuse their own vigour into it, and give it the characteristics of a private venture, like those on which our commercial fabric has been founded. And in departments of industry other than manufacturing it is still the same—the bold man who assumes and is fit for responsibility is always to be found at the head of the successful company, and all devices for the evasion of the burden of administration are calculated to enfeeble enterprise and lead to speedy decay." Of Parliament Dr. Inglis does not think much. "One would hardly expect to look upon Parliament as a possible danger to industry; but there is now a new jurisprudence and departure from sound principles are openly justified on the ground of 'expediency,' which is but a short way of saying the continued existence as office-holders of a particular set of politicians. The men of industry are not a power in Parliament, and are generally too busy out of it to exercise upon it the influence they undoubtedly might possess, and the best that can be hoped for from the legislature, by the working portion of the community, is to be let alone as much as possible, being confident that no very beneficial effect on business is likely to be exercised by a body which regulates its own so badly as to have an incompleted programme at the end of every session as regularly as the session comes to an end." Dr. Inglis falls very foul of trades' unions. "Amendments of the law are also urgently required to meet the case of the member of a trades' union, who, for reasons sufficient decides to withdraw from a society which may have ceased to be useful to him or with whose policy he is no longer in accord. It is obviously a great hardship that many years' subscriptions should have been paid away, and the benefits to which he has become partly entitled should be entirely relinquished upon withdrawal before superannuation allowance is fully earned. And as one of the most objectionable features of trades' unionism is the secrecy with which its decrees are in many cases executed. I would have it enacted that all rules, bye-laws, fines, and restrictions, in fact every ordinance that effects the member of any union should have the sanction of a constituted legal authority such as a county court judge in England, a sheriff in Scotland, or any equally competent and independent official. Such rules or impositions as will not bear examination of this kind are manifestly injurious to the State, and not to be tolerated by a law-abiding community which has got beyond the jurisdiction of Judge Lynch." The epoch was not of great moment to marine engineers for it did not touch them at many points of interest.



THE "RESERVOIR" STEAM TRAP. FIG. 3.

In moving one of the votes of thanks Alderman Kidd, vice-president, spoke of the deputation which had waited on the Borough Council of West Ham to urge the claims of the

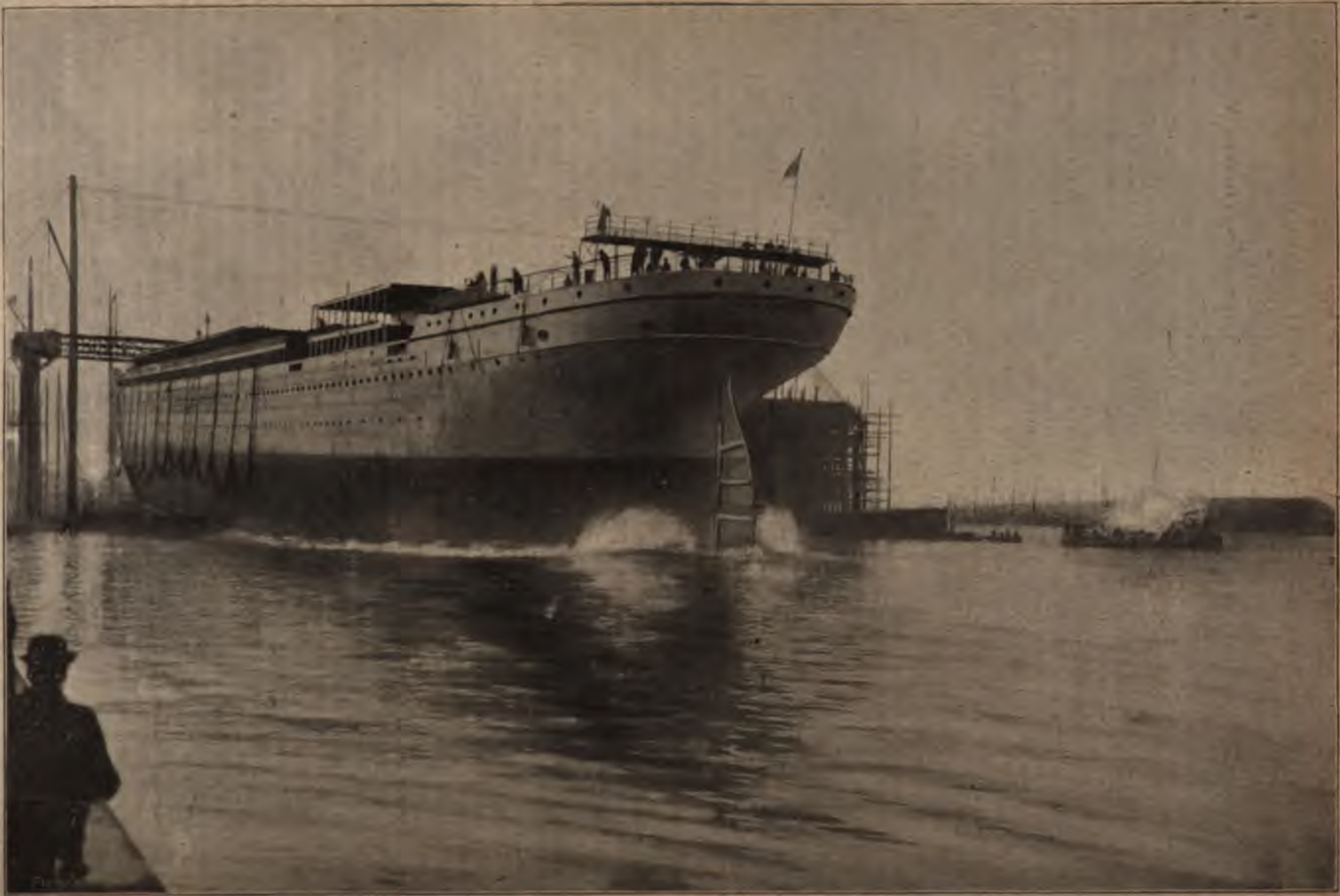
Institute of Marine Engineers in any educational scheme which they bring forward. He ventured the opinion that the Institute would be yet asked for their advice on matters educational.

Messrs. Thomas Wilson, Sons & Co., Limited, of Hull, have secured the services of Mr. A. F. White, of Messrs. Babcock & Wilcox for their engineering department.

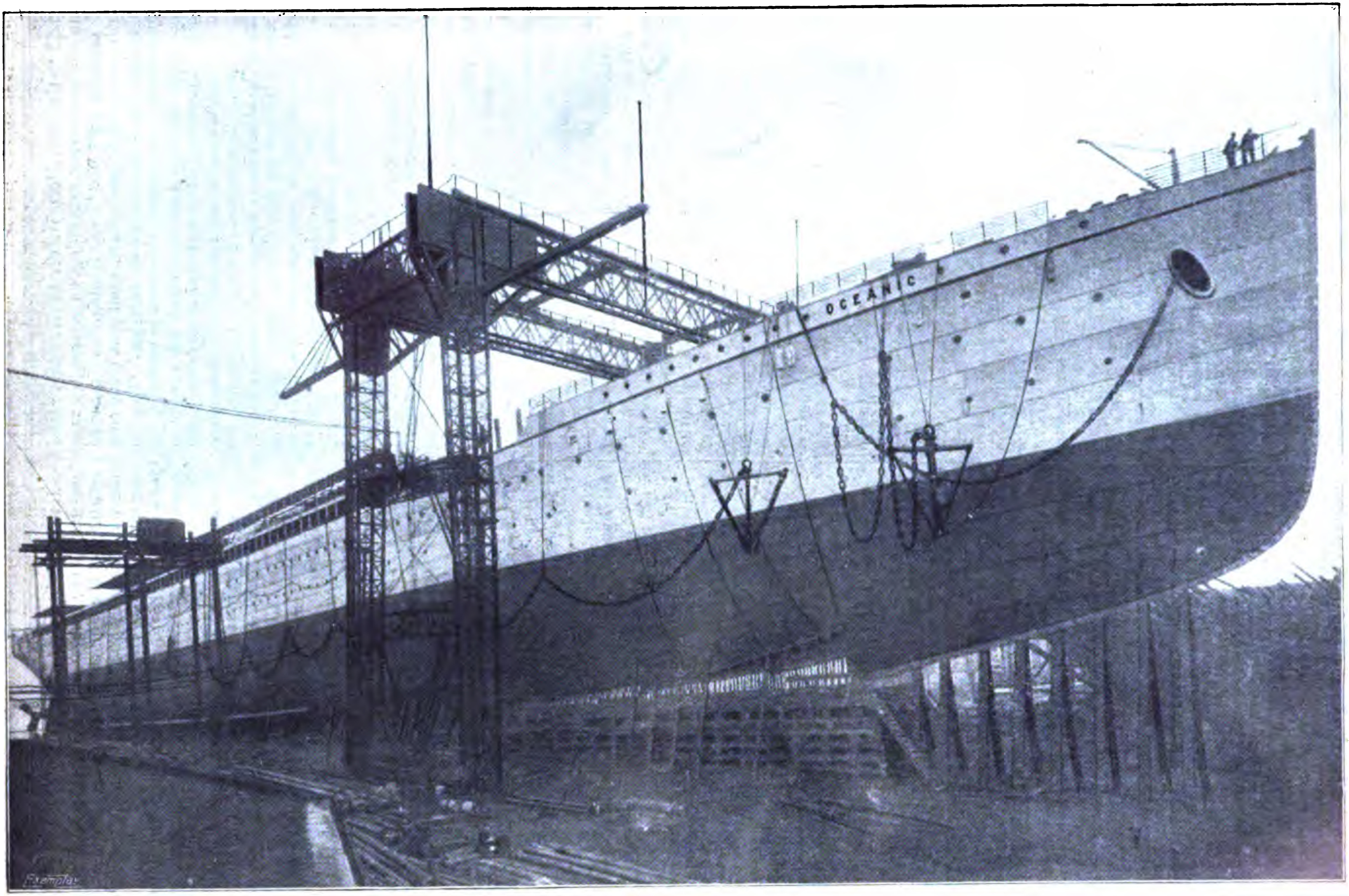
THE "OCEANIC."

THE great and long-expected event in connection with shipbuilding was accomplished last month by the successful launch of the s.s. *Oceanic*, the largest vessel in the world, which took place from the yard of Messrs. Harland & Wolff on Saturday, January 14th, 1899. It was an ideal day for the launch—dry and clear, and thousands of people from every quarter of the globe assembled to witness one of the most interesting events in the annals of shipbuilding. Not the smallest hitch occurred from beginning to end of the proceedings; and, notwithstanding the tremendous crowds, who occupied every available position of vantage, no accident of any kind marred the ceremony.

The keel of the *Oceanic* was laid on March 12th, 1897, but the work was very much delayed pending the construction of a huge gantry 97 ft. high by 90 ft. beam, which weighs 500 tons. This gantry is said to be the largest in the world. It travels on rails on concrete blocks the entire length of the vessel, and forms a species of arch over the ship, carrying rivetting machines, cranes, and electric lamps suspended from the centre. By this means this monster ship was entirely rivetted by hydraulic power. She is the first vessel built in Ireland so rivetted, but owing to the heavy rivets and thick plates used in building these enormous size of vessels, hand-rivetters were utterly unable to cope with the work. It is reported that this gantry is to be duplicated with all its appliances. During the construction of this vessel as many as 1,500 men have been employed on her at times, and in this connection a record has also to be chronicled—that not a single fatality has occurred as yet in her construction, and only a few minor accidents not worth mentioning, which speaks volumes for the care with which she has been built, when we take into consideration the dimensions of this leviathan, which are as follows:—Length over all 705 ft. 6 in. by 68 ft. beam by 49 ft. 6 in. moulded depth. The total depth is about 68 ft., and length between perpendiculars 685 ft. The extreme load draught will be about 32 ft. Her gross tonnage is 17,040; displacement, 30,100 tons. She will have fifteen boilers, twelve double and three single-ended of about 1,100 tons total weight. The engines will be triple, four cylinder, four crank-balanced of about 28,000 I.H.P., driving two three-bladed propellers placed very close together with an opening between them. There is great diversity of opinion as to the rate of speed she will be capable of travelling at, but at present it is her owners' intention to have her arrive at Liverpool or New York on Wednesday mornings, having left the other side the previous Wednesday. It is generally supposed she will travel at a uniform speed of twenty knots, although she will be capable of a much higher speed; but it is well known that the other vessels of the fleet of the White Star Line are more noted for regular passages than very high speeds. The enormous capabilities of the *Oceanic* will, however, be better understood when we take into consideration the fact that if used as a cruiser she will be able to steam 24,000 nautical miles at twelve knots, or round the world without coaling, although it is estimated she will burn on an average 700 tons of coals daily. The *Teutonic*, which, next to the *Oceanic*, possesses the greatest coal endurance of any vessel, war or merchant, can steam 21,600 miles at ten knots; this means that the *Oceanic* will steam 23,400 miles in eighty-one days, and the *Teutonic* 21,600 in ninety days—in other words, in a distance of about 22,000 miles the *Oceanic* will steam 2,000 miles more than the *Teutonic* in nine days' less time. Strange to say, the new *Oceanic* again inaugurates the "long" ship, as her namesake did in 1871. Less than thirty years ago this pioneer vessel of the White Star Line—the first *Oceanic*—left the stocks at Belfast. She had a gross tonnage of 3,807 tons, and her I.H.P. was about 2,000. At that time these figures were considered enormous, and certainly everyone thought that the limit of size had been reached. Since that date her size has been eclipsed again and again; but still, in October, 1889, when on her sixty-second voyage, she proved that she could hold her own by accomplishing a voyage from Yokohama to San Francisco in thirteen days, fourteen hours, four minutes, at that time the fastest passage on record across the Pacific. This vessel may be said to have inaugurated an entirely new type of steamer, as she was the first vessel to carry her saloon and first-class accommodation amidships, an arrangement which has resulted in immense additional comfort to ocean travellers. As we said before, the new *Oceanic* resembles her in one respect at least, being of the "long" type of vessel; but Messrs. Harland & Wolff, Limited, never departed from great length, the *Teutonic*, in the midst of the revulsion in favour of "beaming" boats, being 9·80 to 1, or very much longer than any of the vessels built since 1881 up to the present time. In 1896, however, they lengthened the Union Liner *Scot* to 9·70 proportion, but the new *Oceanic* is 10·07, or exactly the proportion of the *Britannic* of 1874. In appearance the new vessel will very much resemble the *Teutonic*, except that her funnels will be much higher proportionately in accordance with recent practise. One of the Belfast papers shows her funnels drawn to scale with two full-sized tramway-cars side by side put inside one funnel, which gives some idea of their proportions. This vessel will have the largest electric light installation ever fitted in a ship, and her passenger accommodation will be something superb. The number of first-class passengers carried will be 410, second-class 300, third-class 1,000, with 394 of a crew, making a total of 2,104 in all. Passengers will be able to enjoy a promenade of 500 yards without retracing their steps if they take a course to and from the bow of the *Oceanic*, *via* the stern. The vessel has seven decks in all, five of which run from stem to stern. The boat deck naturally does not extend over the entire length of the vessel, reaching only from the captain's bridge to the engine-room skylight. The lower orlop bridge also only extends forward, but all seven decks are plated, thus giving additional



WHITE STAR ATLANTIC STEAMER, "OCEANIC" (*See pages 442 and 459.*)



WHITE STAR ATLANTIC STEAMER, "OCEANIC" (*See pages* 442 *and* 459).

strength to the ship. The rudder fitted to this vessel is also of a new design, consisting, as it does, of four steel castings and one steel forging. It may be described as a solid-plate rudder, each part being cast with flanges for bolting the whole together. The top section, which is the forging, is formed in one with the rudder stock, and the total weight of the rudder is 53 tons. The stern-frame is in one steel casting, the stern-post and the part which forms the screw aperture being in one. The weight of this is 32½ tons, the weight of the after pair of boss arms is about 42 tons, and that of the forward pair about 23 tons. The total weight of the stern-post, boss arms, and the rudder, is over 150 tons. The stem of the stern-frame consists of a 4 ft. steel casting and a massive steel stem bar, whilst the hawse pipes each consist of one solid steel casting, and weigh 7 tons each. She is also fitted with a bilge keel on each side 18 in. deep, and extending 250 ft. of the length of the vessel, a feature which, while latterly employed with notable success to reduce rolling in a beam sea, naturally adds to the rigidity of the structure.

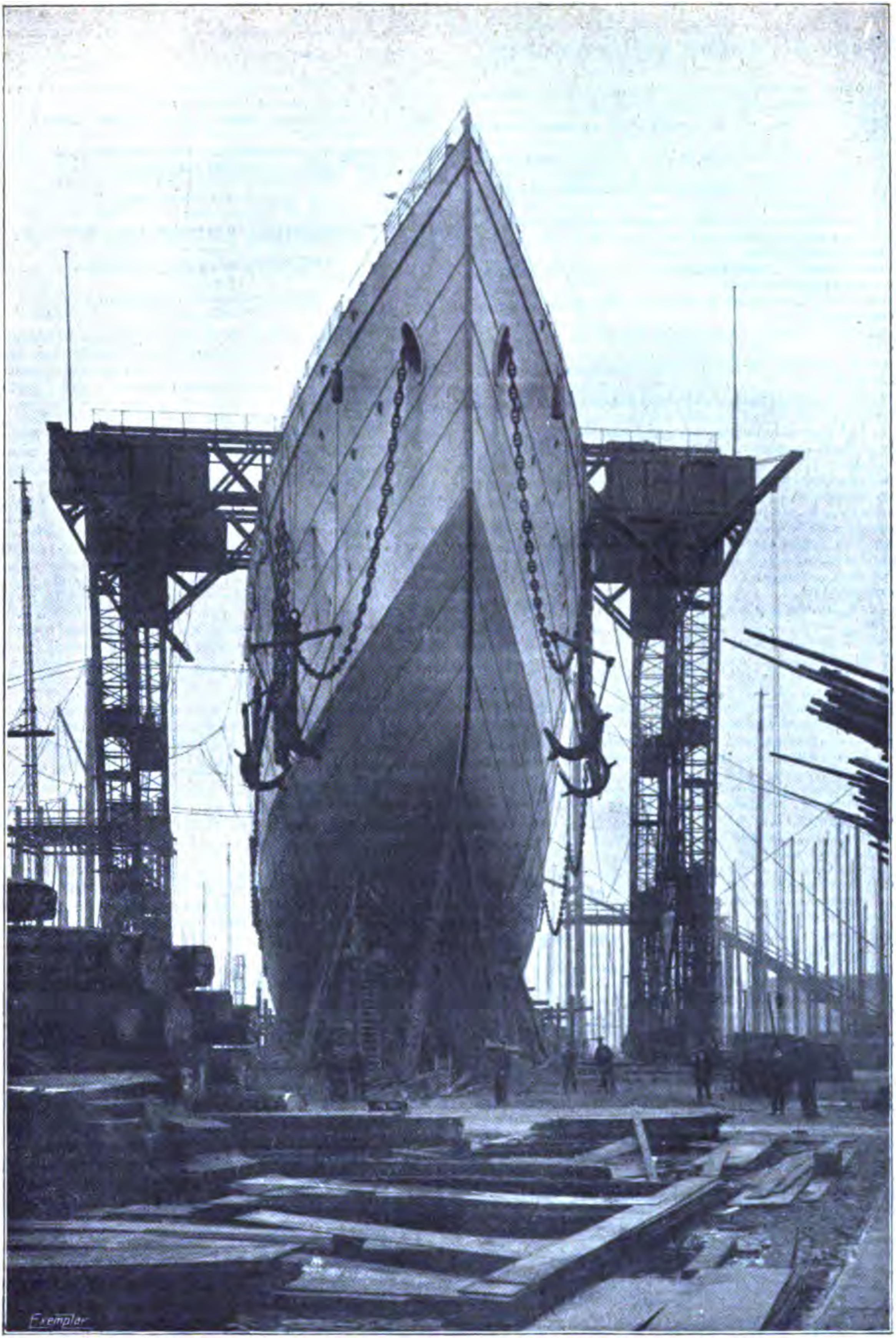
The launch of this vessel has been the theme of conversation all over the shipbuilding world for many months past, and certainly the representative character of the attendance at Saturday's ceremony was convincing proof of this widespread interest. Not a single precaution for the safety of the public or the protection of the vessel was neglected; never, in point of fact, were such elaborate and complete arrangements made for a launch, but never again had such a monster left the ways. A minute before the great hull began to move the sun shone out brilliantly, and showed the magnificent outlines of the vessel to fullest advantage. The yard was exclusively closed to the public, only the workmen immediately concerned in the launch of the ship being admitted, and everything was done in the quietest possible manner, not a shout or sound being heard save the clang of hammers and battering-rams relieving the wooden shores, so as to allow the big ship to get to her native element. The signal that all small boats and steamers in the river were to "stand clear" was given by the firing of two rockets in the yard at 11.15 a.m. All eyes were now concentrated upon the vessel, but still she did not move. Five minutes elapsed when another two rockets were fired, the signal for the tugs to "stand by." Then at twenty-seven minutes past eleven the final shots were fired. Every workman in the yard stood clear of the vessel, when Mr. A. M. Carlisle, manager, gave the signal for the launch, and the huge vessel glided silently and gracefully with gradually-increasing momentum down the ways amid a grand volume of cheering, which even the discordant shrieks of from thirty to forty syrens failed to drown. The anchors and cables did their work well, and barely two minutes from the signal for the launch the *Oceanic* had been pulled up, almost within her own length, and floated majestically before the grand stand, on which were gathered a goodly number of the nobility from all parts of the United Kingdom. Accommodation was provided on this stand for 5,000 in all, tickets being sold at 10s. each, the amount realised being intended to aid the Belfast Royal Hospital. The beautiful, yacht-like lines of the vessel were much admired, and these were certainly shown to perfection by the ship being painted a light colour. This colour, it is said, was adopted by the firm in order that good views could be obtained of the launch on the cinematograph. The *Oceanic* is coated with Briggs' Bituminous Enamels and the same firm has on hand three other large steamers for the White Star Line. Immediately the ship had successfully reached the water, congratulations were showered upon the members of the firm, the Lord-Lieutenant of Ireland sending a congratulatory telegram to the Right Hon. W. J. Pirrie, the head partner of Messrs. Harland & Wolff, Limited.

One of the features in connection with the launch of this vessel was the patent hydraulic pawl bit, which is designed to take the place of the old-fashioned dog-shore pawl. The system adopted enables the builders to take the entire weight, and so maintain the vessel's position until the keel blocks are removed, and thus by a simple arrangement the lady officiating on such occasions by simply opening a valve, which is placed in a convenient position, can at her pleasure set the vessel in motion. The invention is most effective, and consists of a lever projecting through the centre of each of the launching ways, and pivoted on a pin passing through the fixed or lower ways, the lower end of the lever being held in a vertical position by means of a hydraulic ram and cylinder, which is bolted to the lower side of the fixed ways. The sliding way is then placed against the upper projecting end of the lever, and held in position until the pressure (caused by the vessel's inclination) is released. As soon as the valve is opened the lever is free to revolve and the vessel is immediately put in motion. The patent is of great value, inasmuch as the workmen are enabled to be entirely clear of the vessel when in motion, and it is undoubtedly a great advance upon the old method of launching.

Mr. P. Phorson, director and works manager of Messrs. J. L. Thompson & Sons, Limited, claims to be the originator and patentee of the launching trigger.

The *Oceanic* is now berthed at the 100-ton crane receiving her boilers and machinery, and it is expected that in about six months from date she will be trying her metal against the billows of the Atlantic.

Messrs. John Penn & Sons' Engineering Works.—This is an age of combination in the commercial world, and rumours have been prevalent, during the past fortnight that the famous engineering and boiler works of Messrs. John Penn & Sons, at Greenwich and Deptford, are about to change hands. It is stated that negociations have been entered into between the firm and the Thames Iron Works and Shipbuilding Company, Limited, by which the latter firm are to take over the whole business and works of Messrs. Penn & Sons. It is interesting to note that, with the exception of Messrs. Maudsley, the marine engineering business of Messrs. Penn & Sons is the oldest in the London district, having been started by the grandfather of the present proprietors in the early part of this century. Although for the past few years the output of the works has not been what it has been previously, at the same time the yhave turned out some highly satisfactory jobs, among which may be mentioned the engines of the British battleships *Magnificent*, *Goliath*, and *Illustrious*. We are in a position to state, from information obtained from a reliable authority, that the actual definite settlement of the matter is not yet an accomplished fact, and we shall probably refer to the matter again in the near future.



White Star Atlantic Steamer "Oceanic." (*See pages* 442 *and* 459.)

NAVAL ENGINEER APPOINTMENTS.

THE following appointments have been made at the Admiralty from December 23rd, 1898, to January 25th, 1899:—

Adamson, P. A. N., has been appointed assistant engineer R.N.R.

Anderson, W. J., chief engineer to the *Terrible*, to date December 28th.

Baldwin, G. W., engineer to the *Pembroke*, for the *Ariadne*, to date December 28th.

Basson, H., engineer to the *Sans Pareil*, to date January 13th.

Black W. J., chief engineer to the *Vernon*, for torpedo-boats, to date December 28th.

Blundell, Stephen H., fleet engineer to the *Victory*, for the *Scout*, to date January 4th.

Canning, H. T., assistant engineer to the *Pactolus*, to date January 17th.

Chase, John E., fleet engineer to the *Terrible*, to date January 4th.

Coopper, H., engineer to the *Victory*, for the *Chamois*, to date January 13th.

Cottam, F. M., chief engineer, has been advanced to the rank of staff engineer in her Majesty's fleet.

Davies, J., has been appointed assistant engineer R.N.R.

Fawdon, H. W., engineer, has been appointed senior engineer R.N.R.

Finch, J. Jackson, chief inspector of machinery, has been placed on the retired list, at his own request.

Fleetwood, J. L., acting chief engineer to the *Vivid*, for the *Antelope*, to date January 13th.

George, F. T., chief engineer, has been advanced to the rank of staff engineer in her Majesty's fleet.

Goodall, G. T., engineer to the *Victory*, for the *Hardy*, to date January 12th.

Hare, J. S., acting engineer to the *Pegasus*, to date January 17th.

Hughes, T., fleet engineer, has been placed on the retired list of his rank.

James, C. J., chief engineer to the *Pembroke*, for the *Pioneer*, to date January 24th.

Jones, J., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's fleet.

Kinning, A. C. C., has been appointed assistant engineer R.N.R.

Leaby, W. P., acting engineer to the *Revenge*, to date January 13th.

Leck, J., has been appointed assistant engineer R.N.R.

Liversidge, E. W., engineer to the *Victory*, for the *Boadicea*, to date January 12th.

Macnicoll, A. D., has been appointed engineer R.N.R.

Marshall, F. W., engineer to the *Theseus*, to date January 17th.

McLean, H. C., chief engineer, has been advanced to the rank of staff engineer in her Majesty's fleet.

New, Thomas, fleet engineer to the *Victory*, for the *Achilles*, to date December 20th.

New, Thomas, fleet engineer to the *Trafalgar*, to date January 24th.

Pamphlett, W. F., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's fleet.

Perkins, W. J. S., acting engineer to the *Theseus*, to date January 17th.

Portch, H. W. (probationary), assistant engineer to the *Theseus*, to date January 17th.

Roper, Robert St. J., chief engineer to the *Vivid*, for charge of torpedo-boats, to date January 4th.

Rees, John S., fleet engineer to the *Victory*, for the *St. George*, to date December 28th.

Rees, John S., fleet engineer to the *Victory* for the *Achilles*, to date January 4th.

Simmons, George T., fleet engineer to the *Theseus*, to date January 17th.

Simpson, J. M., engineer to the *Vivid*, for the *Seal*, to date January 13th.

Stuart, Martin, chief engineer to the *Vivid*, for the *Psyche*, to date January 4th.

Thomas, J. P., fleet engineer to the *Mars*, to date December 28th.

Thompson, J. M., chief engineer, has been advanced to the rank of staff engineer in her Majesty's fleet.

Turner, Wm. F., chief engineer to the *Pactolus*, to date January 17th.

Walker, H. J., fleet engineer to the *Magdala*, to date January 13th.

Walton, J. H., staff engineer, has been advanced to the rank of fleet engineer in her Majesty's fleet.

Whittingham, William, chief engineer to the *Pegasus*, to date January 17th.

Whittingham, W., chief engineer, has been advanced to the rank of staff engineer in her Majesty's fleet.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(From our own Correspondent.)

THE prosperity in the Clyde Shipbuilding and Marine Engineering trade, is sufficiently indicated by the fact that for the year now fairly entered on, the work in hand, and lately contracted for—including the two immense cruisers given out two weeks ago by the Admiralty—amounts to the enormous figure of 560,000 tons, as compared with 397,000 tons at the same period of last year. In 1897, the corresponding figure was 310,000; and in 1896, 260,000 tons. Sailing ships have now entirely disappeared from the scene, and, not a single craft of that kind being ordered, the increase in size of steamers of the cargo-carrying class necessarily goes on apace, and the proportionate flow of horse-power of engines is the result. The estimate of horse-power in hand, including the Government work, may thus be put down at 630,000, compared with 420,000 in 1898; 336,000 in 1897, and 290,000 in 1896. A large proportion of the work, however, is well forward, including the Japanese line-of-battle ship at Clydebank, and many of the larger cargo-carrying steamers. The contracts are well distributed over the whole Clyde area, and while on the lower districts there is an absence of Government work, the tonnage on hand is nearly as heavy as on the upper. Both Fairfield and Clydebank are making rapid progress with the first-class armed cruisers, and at Fairfield the big Currie liners are assuming shape. The bulk of the larger establishments are working double shifts in the engine shops, and this is likely to continue for some time to come.

The two new cruisers which have recently been entrusted to Clyde builders, are each of 14,100 tons displacement, and 30,000 I.H.P. Fairfield has secured one, and Clydebank the other, and in the case of Fairfield, the new cruiser will be the biggest warship ever built at that famous establishment. None of the four immense battleships of 14,000 tons given out at this time have been allotted to Clyde builders, but this is not in the least considered a slighting of the claims of this important centre. The firms which have long been noted for their warship work here, are pretty full up with warship work, Fairfield has two armoured cruisers, and one second-class completing, and another ready for trial. Clydebank has one battleship, and two armoured cruisers. On the other hand, the English firms to whom the battleships have gone were without any warship work and thus the question of early delivery—in which the whole nation must be interested—is satisfied.

The Steel Co. of Scotland has secured the bulk of the orders for the lighter steel material required for the two cruisers just placed with Fairfield and Clydebank. The contract for castings is said to be the largest ever booked in the west of Scotland district.

Since the New Year began there has been further advances made in the prices of Scottish steel, involving an all-round increase of 5s. per ton. Ship-plates now command £7 a ton easily, and are said to have even reached £7 5s. Angles are £6 12s. 6d., and boiler plates £8. Compared with the prices obtaining during the past few years, these quotations show a very material advance. In 1895 steel ship-plates were sold at as low as £4 17s. 6d., and angles at £4 7s. 6d. The following year prices were rather better, plates finishing at £5 12s. 6d. to £5 15s., and angles at £5 5s. In 1897, however, plates, after being £5 12s. 6d. and £5 10s., receded to £5 5s. and finished at £5 7s. 6d., while angles dropped from £5 5s. to £5, and closed at £5 2s. 6d. Last year plates opened at £5 7s. 6d., in June the price was £5 17s. 6d., and by the end of the year the price was £6 17s. 6d.; while angles opened at £5 2s. 6d., and at the end of the year were £6 7s. 6d. to £6 10s. It must not, however, be concluded that the rise from £4 17s. 6d. to £7 5s. in plates means that the difference in price is all net profit. During the past year working costs were very materially advanced; hematite, which was about 52s. a ton at the beginning of last year, being now over 60s.; while in the past year two advances of 5 per cent. were made in wages, and another is more than probable at an early date

In the iron and steel tube-making works of the West of Scotland, the demand, which was almost unprecedented throughout 1898, promises to be even better for the year now entered upon. Most manufacturers have orders booked forward for delivery well ahead. The much-talked-of American and other competition is not yet greatly in evidence, although the improved conditions of trade and the more remunerative prices current in this district, might be regarded as affording a favourable opening. That foreign competition, whatever it may amount to, is not a serious deterrent to enterprise, but perhaps more of a spur than anything else, is shown by the fact that Messrs. Stewart & Menzies, Limited, have lately feued some 13 acres of ground at Coatbridge for the purpose of erecting new works, while the Clydeside Tube Co., Limited, are erecting large works at Airdrie on a site exceeding 20 acres in extent. These works are already well advanced, and will in all likelihood be in operation early in the spring. The latter firm having intimated that they do not intend joining the Tube Association, there will probably be keen competition among local manufacturers in the near future.

With the additional order secured by the Clydebank Co. for one of the new first-class armoured cruisers, this large establishment may now be considered pretty well supplied with Governmental orders, especially when the amount of merchant work also on hand is considered. Besides the new vessel there is the great 15,000 tons battleship *Asahi* for Japan, the launch of which will take place shortly. Then there are the two first-class armoured cruisers *Sutlej* and *Bacchante*, each of 12,000 tons, for the British Government, and in addition there are five torpedo boat destroyers still to complete. For the Cunard Line there is well advanced a big cargo steamship of 9,000 and 6,000 I.H.P.; and for the Red Star Line two large twin-screw steamers are being laid down, each having a tonnage of 11,000 tons and 15,000 I.H.P. The Clydebank Co. have just had passed by the Clyde Trust, who are the proprietors of the land in question, plans for a further extension of their establishment westwards, which will be taken up by new building berths, quays, &c. These extensions which are now being proceeded with are only part of a scheme of rearrangement and extension to the westward of the present establishment, which has been in progress for some considerable time. It will add very materially to the productive capacity of this already huge establishment.

Messrs. William Denny & Bros., Dumbarton, were entrusted about the end of the year with the building of two new twin-screw steamers for the London and North Western Railway Co. to be employed in their Holyhead and Dublin service. They are to be similar in size and general arrangement to the *Cambria*, launched by Messrs. Denny for the same service in August last. The dimensions are 337 ft. length, 39 ft. breadth, and 24 ft. 9 in. depth. The speed will at least be equal to that of the *Cambria*, which fulfilled a guarantee of 21½ knots. The propelling machinery, which will be supplied by the associated firm of Messrs. Denny & Co., Dumbarton, will consist of two sets of triple expansion engines, using steam of 160 lbs. pressure, supplied by eight single-ended boilers. Efforts will be made to have the new steamers—which will be named *Hibernia* and *Anglia*—on their station before the end of the year.

The Scottish Aluminium Co., Limited, have now commenced operations at their new rolling mill works at Greenock. Messrs. Alex Brown & Co., 194, St. Vincent Street, Glasgow, well known representatives of firms manufacturing special metals, have been appointed agents for the company in Scotland. In this connection it may be stated that Messrs. David White & Co., boat and launch builders, Plantation, Glasgow, have built quite a fleet of aluminium boats during the past year, and at the moment they have other three such craft on hand. They built one last year for Klondyke, 18 ft. long, which weighed only 1 cwt. 3 qrs. 18 lbs. Much dubiety still exists as to the suitability of aluminium for shipbuilding in respect of the shell and other features exposed to the corrosive influence of sea water, but it seems bound to come more and more into use in shipbuilding for internal work and fittings. It should be especially of use in the Navy to replace wood, The experience of the Spanish-American war has shown the danger of wood work in fighting ships, and on account of its lightness there seems little question that nothing is so suitable to replace it as aluminium. At the present moment a lot of plates are on order for doors in torpedo boats. In the case of boats used in fresh water the corrosion is much lessened, and for expeditions where boats have to be carried the comparatively small weight of a big boat marks it out as eminently serviceable.

Messrs. Duncan, Stewart & Co., engineers, Glasgow, are making the heavy engines and rolling-mill plant for the manufacture of Belgian girders by the Lanarkshire Steel Co., Motherwell. Much pleasure is felt at the fact of the Lanarkshire Steel Co. taking up this branch of manufacture. Messrs. Lamberton & Co., Coatbridge, have secured the contract for a rolling-mill for the Spanish Government at Trubia.

Messrs. John Macdonald & Son, Hope Street, Glasgow, representatives in Scotland for Messrs. Taite, Howard & Co., Limited, 62, Queen Victoria Street, London, on several days last month organised an exhibition of pneumatic tools for boiler and ship work in the Parkhead Boiler Works of Messrs. Muir and Findlay, which was largely taken advantage of by managers and foremen of Clydeside works. In addition to the Boyer Pneumatic caulking and chipping hammers and the Boyer drills, other machines were shown in operation.

With such an enormous amount of work on hand—and to begin, too—home shipbuilders may reasonably be expected to sustain the demand for the better class of machine tools during 1899, which has all along been a characteristic of the year that is past. Messrs. James Bennie & Sons, of Clyde Works, Polmadie, owing to increased demand upon their resources, are removing to other and larger works in the Govan district of Glasgow. To three of the workshops at Johnstone large extensions have been made during the past year, while, to cope with the extension of their business, Messrs. Craig & Donald have recently purchased the modern tool works erected some time ago for Messrs. Littlejohn & Service, who have ceased business. This important accession to their already large premises will greatly facilitate the output of the firm's specialities, being well equipped with the best appliances, and will entail the employment of a large number of additional workmen.

The United Flexible Metallic Tubing Co., Limited, of Queen Victoria Street, London, have been finding such demand for their speciality in the way of metallic tubing for steam, water, gas, and other purposes on the Clyde and West of Scotland districts, that they are opening a branch office at 52, St. Enoch Square, Glasgow, where under the management of Mr. W. Jessel, a large and varied assortment of tubing will always be shown and kept in stock. Tubing for the conveyance of steam, at pressures in advance of anything as yet carried on board ship, is being manufactured, and both for steam and hydraulic purposes many of the large shipyards and boiler works on the Clyde are availing themselves largely of the Co.'s manufactures. The works of the Co., which have hitherto been at Greenwich, are being transferred to much larger premises at Ponder's End, London.

With a continuation of the present rate of progress, a few months should see the whole of the walls of the new deep-water dock at Leith finished, and sufficient of the quays formed to enable sheds and cranes to be proceeded with within the course of the year. The new dock will have a depth of 40 ft.; affording a clear depth of about 30 ft. at high-water of ordinary spring tides and a length of 1,100 ft., and width of 550 ft., and it is entered direct from the harbour channel, much nearer the open sea than the entrance of the docks already existing—the Albert and the Edinburgh. The entrance will be through a lock 350 ft. long by 70 ft. wide. The massive gates for the entrance lock are being made wholly of steel and fine iron. Each pair will weigh close on 300 tons, and they will be moved by hydraulic machinery. Another important feature is the construction of a lock or passage 60 ft. wide, connecting the new dock with the present Albert Dock. The work is now well advanced, the walls being up to fully half their height, and in the course of two or three months they should be sufficiently completed to admit of the lock gates being placed in position. When the whole work is finished, vessels of deep draught will be enabled to enter the Albert and Edinburgh Docks from the channel, *via* the new entrance lock and dock, which will greatly facilitate the movement and working of such vessel. The east wall of the new dock is not at present being completed to its full extent, but is being so arranged, that when desired, the dock can be extended to nearly twice its present length.

During 1898 a large number of additions have been made to the exhibits in all departments of the Edinburgh Museum of Science and Art. In the machinery hall the principal addition is a sectional model of the compound engines of the *Zealandia*, made in the Museum workshop, and which is placed in the case beside the complete model. The parts have been labelled so as to explain their use, and to point out the direction in which the steam travels, and its action, thus making intelligible to the onlooker what at first sight appears a very complicated piece of machinery. A small electro-motor, given by Messrs. Siemens Bros. & Co., from which part of the cover has been removed, shows, as far as may be, the means used for the conversion of the electrical current into mechanical power, and an interesting set of photographs, given by the Science and Art Department, illustrates an important stage in the development of the locomotive.

News has recently been received in Glasgow from Central Africa regarding the trial trip of the new steamer *Princess*, which has just been placed in the Zambesi by the African Lakes Corporation. The vessel, like several of her predecessors, was built by Messrs. Ritchie, Graham & Milne, of Whiteinch, Glasgow, then shipped in pieces and put together again at the mouth of the Zambesi. The steamer left Chindi, at the mouth of the river, with a company of 30 on board, and the journey to Chiromo was accomplished in 4½ days, including stoppages for wood and incidental delays. This, with the Zambesi in its present condition, is regarded as very creditable steaming. In appearance the vessel is an ordinary stern-wheeler, her chief features being her ample passenger accommodation, her large dining saloon, and fine shade deck. She has accommodation in the cabin for 20 passengers, and at a pinch additional berths can be improvised. The saloon is on the upper deck. It is open in front, so that the passengers get all the breeze that is going, and see where they are going, a great advantage on a monotonous voyage like that from Chindi to Chiromo. The engines are double compound, and have a patent condensing apparatus. The boilers are provided with forced draught. The *Princess* is in charge of Captain J. C. Copland and Mr. Alex. Munro, engineer, two of the best men in the employment of the Corporation.

Before the members of the Glasgow University Engineering Society on the 13th ult., Mr. John Thom, M.I.N.A., read a paper on "Auxiliary Engines in Steamships in connection with the Main Engine." Mr. Colin Houstoun, of Muir & Houston, Limited, occupied the chair. Mr. Thom advocated independent air and circulating pumps in preference to the arrangement usually adopted, viz., that of air pumps driven by levers from the main engine. Several neat arrangements of combined air and circulating pumps were shown upon the screen, these pumps being driven direct from a steam cylinder. He then discussed the question of feed pumps and automatic regulation, and several very compact arrangements of independent feed pumps and float tank were shown. The special features of the type of direct acting pumps were illustrated effective arrangement of valve gear and the noiseless action of the pumps under every condition of working. With regard to the float tank a new departure was shown by the substitution of a spiral spring to counterbalance the float instead of the ordinary arrangement of lever and balance weight. The lecturer thought this was considerable improvement, as the spring assisted the float more effectually than the balance weight. Mr. Thom then dealt with the subject of pumps for bilge and ballast purposes, illustrating this by numerous slides of duplex and simplex pumps. He pointed out that the particular type of simplex pump illustrated had the advantage over the duplex where there was the possibility of drawing air and vapour, as the pump under these conditions continued to work full stroke without the slightest noise, the only difference being the increase of speed, whereas the duplex would shorten stroke and become very noisy in working. Mr. Thom then dwelt in an interesting manner on the subject of economy of steam used by the auxiliary machinery, and exhibited slides showing a novel departure in the method of driving of independent systems of air, circulating and feed pumps which show a distinct step towards the solution of the problem of auxiliary steam consumption, which marine engineers have had of late to face. After an interesting discussion, the chairman (Mr. Houston) invited the members to the trial trip of a steamer in which the various arrangements illustrated in the lecture would be seen in full working order.

Two functions generally associated with the anniversary of the birth of James Watt, were held this year as formerly. These were the delivery of the "Watt Lecture" at Greenock, the town of Watt's nativity, and the holding of the "Watt Dinner" in Glasgow, under the immediate auspices of the Institution of Engineers and Shipbuilders in Scotland. The lecture was given on the night of Friday, 20th ult., by Sir Nathaniel Barnaby, K.C.B., vice-president of the Institution of Naval Architects, and formerly chief constructor of the Navy, his subject being "Steam speeds at sea." The dinner was held in the Windsor Hotel, Glasgow, on the following evening, Mr. George Russell, President of the Institution of Engineers and Shipbuilders, presiding, with Mr. Robert Caird, F.R.S E., and Professor W. H. Watkinson acting as croupiers. The company numbered nearly 300 gentlemen. Amongst the speakers were Sir A. J. Durston, K.C.B., Engineer-in-Chief of the Navy; Col. J. Denny, M.P., Robert Caird, F.R.S.E., Greenock; Mr. Henry H. West, Liverpool; Col. Bingham, Sheffield; Principal R. H. Story, and Sir William Arrol, LLD., M.P. Sir A. J. Durston, in the course of his reply to the toast of "The Navy," made some reference to the introduction and development of higher steam pressure in boilers at sea. This was, he said, an age of high pressure all round, and by a combination of circumstances, he happened to be in a position of some responsibility among his colleagues in giving advice on this work, which had been the outcome of competition around us, and was only one of the many improvements in the other parts, such as armour, guns, mountings, ammunition, which go to complete the fabric and equipment of a ship. As it had been well put, various other questions had arisen which were but as ripples on the surface of a great wave; but this he could say, that the introduction of a higher pressure in water tube boilers had in our large ships enabled 50 per cent. more power on the same weight and space to be maintained continuously at sea than was the case with the former low pressures. From this district, in which was initiated the work of James Watt, the Scotch boiler, the compound and triple-compound marine engine, it was no small satisfaction to receive words of praise, but this was much added to by the knowledge that among them there were many who were advocating, by invention and practice, the use of higher steam pressures in water-tube boilers.

In proposing "the memory of James Watt," the chairman recalled the prominent incidents in Watt's career, and briefly enumerated his outstanding inventions. He declared that if the modern machine tools and materials for construction they had to-day had been available in Watt's time, there could be little doubt that he would have rapidly arrived, not only to our present practice, but to far greater improvements, which were to us yet undiscovered.

THE TYNE.

(*From our own Correspondent.*)

Shipbuilding.—During the first month of the new year the weather has been unfavourable for the carrying on of outdoor work, and the construction of vessels on the stocks has consequently progressed but slowly. The fitting out of vessels in the water, however, has gone on apace, and it is perhaps as well that the pressure of work in the finishing departments of the various yards should be somewhat lightened before many further launches take place. During the whole of 1898 several shipbuilding establishments on the Tyne had never less than three vessels receiving their machinery equipments at the wharves, and it is almost unnecessary to state that the fitting-out of one, or at most two, at a time would be more convenient as well as more economical. In connection with the Elswick yard, there are seldom less than half a dozen vessels moored at the quays; but these are war vessels, and it is well known that boats of this class take a much longer time to equip than even the most costly merchant ships. The work of equipment can, however, be carried on independently of weather conditions, and that is why the good progress already spoken of has been rendered possible on both war and merchant ships now being got ready for delivery.

It would seem that the project of constructing a large graving-dock—fit to accommodate vessels over 600 ft. long—on the Tyne has now been definitely abandoned, and the alternative plan of constructing an immense pontoon to be located at Jarrow slake is all but decided upon. The pontoon is to be built by Messrs.

C. S. Swan & Hunter, whose experience in this kind of work is unique, and whose capability to achieve the best results in the shortest time is unquestionable. We presume some mutually satisfactory arrangement will be entered into with the builders, which will give the Elswick firm the right of first call upon the pontoon; but we do not suppose it will be reserved for the use of that firm exclusively, but will have occasional "vacant dates" available for the accommodation of other company's ships. Should Messrs. Swan & Hunter get an early start with the work of construction, we should not be greatly surprised—considering what was accomplished in the case of the Stettin pontoon—to see the new floating dock moored in its position and ready for the reception of ships by the end of the present year.

The prospective retirement of Mr. Robert Knight from the general secretaryship of the Boilermakers and Ironship Builders Society has too important a bearing on the future of the shipbuilding industry to be passed over in silence here. Mr. Knight has held the position referred to for twenty-eight years, and has, by a policy of repression and carefulness, helped to make the society what it is to-day, namely, the richest and most powerful trade union in existence. The "repression" spoken of was exercised against that aggressive spirit which was always manifesting itself among a section of the members, and which, had it not been kept well in check, would have done incalculable injury to trade; and the "carefulness" was exemplified in the conservation of the funds and the methods of investment adopted. There has been nothing brilliant in Mr. Knight's management of the Boilermakers' affairs, but there has been a good deal of plodding industry exhibited, accompanied by a stolid indifference to criticism, and judging by results these are the kind of qualities that are most to be desired in a trade union leader. The selection of Mr. Knight's successor will be watched with the keenest interest by the shipbuilding and engineering employers of the country, for none know better than they what fractious elements exist in the rank and file of the Boilermakers' Society, and how easily mischief might accrue if some socialist fanatic lunatic should get hoisted to the direction of affairs. That there are men of the kind indicated holding positions in the society there is no doubt, and that some of these will have the effrontery to bid for the highest fruit is equally certain. Candidates of the combative and aspiring type will surely be forthcoming, and these will find a sympathetic audience among the younger portion of the members, whose voting powers is, unfortunately, equal to that of their saner colleagues. The young members, however, are not the best attenders at meetings, and in that circumstance there is hope that the selection of the man to succeed Mr. Knight may be largely in the hands of those who are best able to discriminate.

Before leaving this subject, it is, we think, desirable to refer to a system of wages settlements, introduced by Mr. Knight some years ago, and which has been productive of immense advantages to both masters and men. We mean the arrangement which limits all claims for reductions or advances of wages to a maximum of 5 per cent., and which precludes any further change for six months from the date of any specific re-adjustment. Had it not been for the existence of this salutary measure, it is almost beyond question that much dislocation of trade would have occurred last year from strikes, and it is its continuance which guarantees an immunity from such profitless quarrels during the year upon which we have entered.

It is to be devoutly hoped that pending changes will not in any way jeopardise this arrangement which is the best legacy Mr. Knight leaves to those who for so many years have accepted his leadership.

There is at this moment a temporary lull at the Elswick Yard of Messrs. Armstrong, Whitworth & Co., and in almost all departments the complement of hands has been reduced. It is understood that the slackness is not caused through any lack of work; but is the result of a decision, arrived at by the directors, to render the building berths at the west end of the yard more capable of supporting heavy structures, by "piling" them throughout. The contractors who have undertaken the work are using every available means to hasten its completion, and already very satisfactory progress has been made. These berths, it is expected, will be capable of sustaining the heaviest warships that are ever likely to be brought into requisition.

The announcement that the Palmer's Company had been commissioned to build one of the four battleships required by the Admiralty, has caused some satisfaction, though not much surprise, in the district, as it was felt that the great Jarrow firm could not very well be passed over, in any new distribution of Government work. The directors of the company have gone to vast expense in fitting their establishment for the building of the various types of warships, and it is beyond question that their achievements in this branch of naval architecture are equal to anything hitherto done by any private firm. That a battleship should be placed with them at the present juncture, is therefore no more than was expected, and it is hoped that they will also get a proportion of the new torpedo-destroyers to build.

Messrs. Wigham, Richardson & Co. have their building berths fully occupied with vessels of a good type, and at Messrs. Hawthorn, Leslie & Co.'s yard, the appearance of activity that characteriesd it all last year is still maintained. Messrs. Stephenson's yard is very busy, and at Messrs. C. S. Swan & Hunter's establishment there is not an empty berth to be seen. The latter firm are preparing their pontoon yard for a big contract that is understood to be now in negotiation.

Messrs. Readhead & Sons launched on the 12th inst. their first vessel for the year, this being a fine cargo boat of large dimensions, ordered by owners at Cardiff. The firm have now another vessel almost ready for launching, and three others in the various stages of plating, framing, and commencing. In the repairing department a satisfactory business continues to be done, the large graving dock being scarcely ever without an occupant.

The Tyne Shipbuilding Co. have the whole of their building space occupied, and at the smaller yards near the mouth of the river, a full amount of work is also noticeable.

The pontoons and graving dock belonging to the Smith's Dock Co. are pretty constantly occupied.

Engineering.—The whole of the marine engine works continue to show a high state of briskness, and there is no instance in which night work is not resorted to as a means of accelerating production. In the locomotive works a similar state of things exists, and manufacturers of colliery and chemical plant are equally well off for orders. Local steel works are as busy as possible, and an important new departure is, it is said, about to be made at one of the largest works of this kind in the district. In the forges business continues to be exceedingly brisk. With a view to meet the pressing requirements of customers, the Blaydon Forge Co., of which Mr. Robt. Bowran, of 3, St. Nicholas' Buildings, Newcastle, is managing director, are carrying out large extensions, and putting down new plant of the most effective kind obtainable.

The Combination Metallic Packing Co., Lombard Street, Newcastle (works at Gateshead), are experiencing a well-sustained demand for their speciality, a large proportion of the commissions in hand being repeat orders.

The important extensions which Messrs. Thos. Proctor & Son, ship tank, ventilator, and lamp manufacturers, Newcastle, are carrying out at their Gateshead works, are now nearly completed, and a quantity of additional machinery of the best description is being put down.

Mr. W. F. Snowdon, of No. 2 Side, has just now a large number of marine boiler covering contracts in hand, and has some exceptionally important contracts of the same kind to proceed with in the course of the year. It may be added that Snowdon's patent removable mattresses for boiler covering have been specified for a number of steamers to be built and delivered this year.

Blyth.—The Blyth Shipbuilding Co. are well employed in the building of vessels, the building berths being all full. In the Company's graving docks, two steamers, the *Linda* and *Elemore*, are undergoing extensive damage repairs. During the rough weather which prevailed in the first days of the New Year, the *Elemore* was driven ashore on the beach, south of St. Mary's Island, and remained there till the 14th inst., when she was successfully floated, and afterwards brought into Blyth. The work of salvage was performed by the Blyth Shipbuilding Co., who, as already indicated, are now engaged in the vessel's repair. Since the opening of the new loading staithes, coal shipments at this port have undergone a marked increase.

The announcement has been made that a number of local gentlemen have formed a company to start a new shipbuilding business, and that a manager has been engaged. No names are as yet forthcoming.

Change of Address. — The Institution of Mechanical Engineers have removed to Storey's Gate, St. James' Park Westminster, S.W.

THE WEAR.

(*From our own Correspondent.*)

Shipbuilding.—There perhaps never was a time when so much was being done in the way of shipyard extension and development on the Wear, as at this moment. Of the thirteen shipbuilding firms on the river, more than half are making changes of one kind or another—changes which in some cases will have the effect of almost doubling the productive capacity. Only a passing reference need be made here to the improvements that have been in progress for some years at the yards of Sir James Laing & Sons, and which may now be said to have practically reached the point of completion. The progress of these alterations has been noted from time to time, and all that need now be said with reference to them, is that the general result is, the addition of two large building berths running almost parallel with the stream; an extensive fitting-out jetty, and a new machinery shed of large proportions and up-to-date equipment.

At Messrs. Doxford's yard, the comparatively small jetty on which the shear-legs stand, and beside which vessels are moored while receiving their machinery, is being largely extended, so as to afford greater facilities for the work of "fitting-out." It is understood that—in addition to other important work—the firm have one or two more Clan liners to build, and also that they will be in a position to commence constructive operations on the big P. & O. boat, ordered from them, in the course of a few weeks.

Messrs. John Priestman & Co., have acquired a large piece of ground on the east side of their yard, in which they are about to build two meat carrying steamers to be 425 ft. long, and of great carrying capacity, that have been ordered by German owners. It is understood that the addition will almost double the size of the yard. A big addition has also been made to Messrs. Pickersgill's yard (on the west side) and the work of levelling the new ground has been commenced. This will give the firm a couple of additional building berths, capable of receiving vessels of the largest class.

Messrs. Short Brothers are also carrying out improvements, and it is rumoured that alterations are contemplated at another yard above bridge. Messrs. Austin have commenced the construction of new shops on the old bottle works site, acquired by them some time ago, and Messrs. Bartram & Sons are pushing on the work of preparation at the new site near Castletown, to which their business will ultimately be removed.

At the Sunderland Shipbuilding Co.'s yard the berths are fully occupied, and the same may be said respecting Messrs. Blumer's yard and that of the Strand Shipbuilding Co.

Messrs. J. L. Thompson & Sons are as full of work as they could desire to be, and are making fair progress with the contracts in hand, notwithstanding the unfavourable weather. This firm, to show their appreciation of the efforts which resulted in the magnificent output to their credit last year, paid to the whole of their foremen and officials double wages for the last week of the year. This is an act well worthy of recording, and one which is highly creditable to all concerned

Our present reference to this firm may fitly include an incident in connection with the launch of the *Oceanic* at Belfast. It has been stated that the launching apparatus used with such marked success was an original contrivance, the credit of which was given to the manager of the Queen's Island yard. As a matter of fact, the apparatus was invented by Mr. Phorson, of the North Sands yard, Sunderland, and has been constantly used at that establishment since the early part of 1892.

Engineering.—A new engineering enterprise, which has been started under very favourable auspices, is this month to be reported. We refer to the opening of the West Moor Engine Works, at Pallion, by Mr. R. P. Lynn, formerly of the St. Luke's Engine Works, in the same locality. The new works have been fitted up with every modern convenience and with a first-class equipment of machine tools, and, what is probably of no less importance, a good many orders, to commence operations upon, have been secured. The manufacture of steamship accessories will be the main feature. and there are already in hand a number of steering gears, water-tight doors, &c., for ships building in the north.

Another item of interest in connection with engineering development is also to be reported, namely, the acquisition by Mr. P. J. Smith, Pier Engine Works, South Dock, of a piece of ground adjoining, which is to be utilised for extensions. There is reason to believe that through this addition the business of the Pier Engine Works will be very largely developed.

In the marine engine works business is as brisk as ever, and in every case one or more vessels are being fitted with their machinery. Messrs. Maccoll & Pollock have received an order to supply the engines of two vessels building at Stockton, and it is understood they are in negotiation for other work on terms, however, of deferred delivery.

At the Bloomfield Engine Works of Mr. A. A. Rickaby, a steady business is maintained, the various specialities of the firm continuing to be in good demand. The Vulcan Works (J. G. Moore & Co.) are also fully employed, and having been recently extended, are now showing a greatly increased output. The orders for Moore's patent steam hoist, and also for duplex and centrifugal pumps, are very numerous.

Forges and iron foundries are still as busy as possible, and the electrical department connected with the Sunderland Forge is well supplied with orders of an exceptionally interesting kind.

The **Hartlepools.**—Messrs. W. Gray & Co. had their first launch for this year on the 12th inst., the vessel being one of large size ordered by local owners. The three yards belonging to the firm are full of work, and at the Central Marine Engine Works the machinery is kept running night and day.

It has been stated lately that Messrs. Gray & Co. have been commissioned to build a couple of large vessels for Messrs. Wilson, of Hull. The Hartlepool Engine Works continue to be very busy throughout the whole of the principal shops. In the departments for the manufacture of auxiliary machinery orders are plentiful, particularly for Morison's evaporator, which is steadily gaining in popularity.

Stockton.—In the shipyards business keeps brisk, and the pressure of work at the engineering establishments has not lessened. A scheme has been formulated for the erection of new steel works to cost £300,000 in proximity to the blast furnaces at Port Clarence. The steel is to be made of iron manufactured from Cleveland ores, and the open hearth process is to be employed. The use of hematite ores will thus be dispensed with, and a consequent impetus given to trade in the Cleveland district.

Middlesbro'.—Messrs. Raylton Dixon & Co. have commenced the year's launchings with a fine vessel for the Indo-China Co., and Messrs. Harkess & Son have put one in the water, ordered by a London agent for a firm at Bremen. Messrs. Craggs will shortly put a vessel off the stocks, and all the firms named have work enough to keep their yards busy throughout the year.

Darlington.—One of the most important contracts turned out by the Darlington Forge Co. last year was the cast steel stern frame and brackets for the White Star Liner *Oceanic*, the total weight of which amounted to 105 tons. These castings are said to be the heaviest of their kind ever yet produced.

THE MERSEY.

From our own Correspondent.)

BOTH the marine and general engineering branches of industry throughout this district, remain in much the same satisfactory position as reported for some time past. Except that here and there ship-repairing yards are not quite so busy as they have been, the amount of work in hand generally continues much above the average, and all the leading machine tool makers engaged on special appliances for marine engineering requirements are busy for many months ahead, whilst as regards general engineering tools, it is exceptional where the principal firms are in a position to entertain new work which can be delivered within the next six or nine months. Boiler makers stationary, and locomotive engine builders, and electrical and general engineering firms all report work coming forward in excess of orders running out, and with this pressure there is no difficulty in getting advanced prices on all new work being booked. The position of the engineering trades is, in fact, more satisfactory than it has been for many years past, and the outlook for the future is most encouraging.

The usual monthly returns issued by the leading engineering trade union societies, continue to afford ample evidence of the present activity in trade. The Steam Engine Makers Society has only about one per cent. of its total membership on out-of-work donation, whilst in the Manchester and one or two other Lancashire districts, practically a "clear book" is reported. The United Machine Workers' Association has only 2⅝ per cent. on benefit, and in the Manchester district, the proportion is not more than 1⅜ per cent. Reports as to the state of trade continue very favourable; out of forty-five reports, thirty-seven describe trade as "good," and the remainder as fair or moderate. The only direction in which any slackening off is noticeable, is, as already intimated, in some of the ship-repairing centres, and this is easily explainable.

The annual report of the British Steel Smelters' Association, which has during the past month been issued to the members, states that the past year has on the whole been a not unfavourable one. In the Midlands, the North-West and North-East districts, and in the West of Scotland, trade had been unprecedentedly brisk, with better prices and higher wages, two advances of 5 per cent. in the wage rate having been conceded. In the early part of the year a deputation of all the societies connected with the iron and steel trades appeared before the Home Secretary, on the question of compulsory weighing. This interview was of a very satisfactory character, but if further progress was to be made, they would have to jog the memory of the Home Secretary, and continue to agitate until the legislation they desired was obtained. Six new branches had been opened during the year, and four had become defunct. The membership had risen from 3,991 to 4,605, an increase of 614. The year's income had been £8,513, and the expenditure £4,095, a gain of £4,453. This, with the balance on hand at the end of 1897, gave a cash balance of £12,945. The sum of £1,264 had been spent in relief of the distress caused by the miners' lock-out in South Wales.

Messrs. Laird Bros., of Birkenhead, have secured from the Government an order for the hull and machinery of a first-class battleship, which will be laid down in the building dock to be vacated by H.M.S. *Glory*, in March next. This makes the fourth battleship ordered from the firm for the British Navy in recent years, the *Royal Oak*, *Mars*, and *Glory* having been built by them. The new battleship will be of 14,800 tons, and 18,000 I.H.P.

The Unbreakable Pulley and Mill Gearing Co., Limited. of West Gorton, Manchester, have just commenced building operations for an extension of their pulley departments, in order to cope with the increased demand for the "Wells" patent "Unbreakable" pulleys, of which they are the makers.

A very ingenious American invention for manufacturing metal hinges automatically throughout, is being introduced into this country by Mr. Tom Taylor, of the Royal Exchange, Manchester. In this process a roll of metal is wound in coils of a large diameter, in as long lengths as convenient, up to about 100 ft., and is fed through rolls with a cam motion into the machine, where it is gradually manipulated into the separate wings of the hinge. The connecting bolt for the hinges is supplied from a coil on which is rolled a length of wire rod of suitable thickness, and which is fed in at the proper time as required, the whole operation being automatic, and the hinge is delivered from the machine complete for use. One of these machines has turned out from forty to fifty butt hinges per minute, and we have been shown excellently finished samples of hinges made by this process.

During the past month an exceedingly strong tone has characterised the iron market here, and a considerable weight of business has been put through. In pig iron especially, prices have shewn a further substantial advance on all the leading brands offering in this district, and although perhaps at the top figures now asked there is not that great weight of buying, a considerable enquiry is stirring, and sellers are cautious about entering into engagements, whilst there is a shortness of supplies as regards most of the principal brands. Lancashire makers have got as much as 55s. less 2½ for foundry, delivered Manchester, but are indifferent about selling further even at this figure. Lincolnshire makers are so well sold that they are practically out of the market. It is difficult to get any really definite quotations, but foundry qualities could scarcely be bought under 52s. 6d. to 53s., and good foundry Derbyshire averages about 54s. 6d. to 55s. net, delivered Manchester. Forge qualities have shown a very substantial upward move, the minimum figures being now about 53s. for Lancashire, less 2½, and 51s. for Lincolnshire, net cash, delivered Warrington. In outside brands the current quotations for good foundry Middlesbrough, net cash, by rail Manchester; with Scotch iron 59s. 9d. to 60s. for Glengarnock, and 60s. to 60s. 6d.; for Eglinton, and American pig iron 53s. net cash.

In the finished iron trade a very strong position is maintained, especially as regards bars, prices for which have been advanced 5s. per ton, with makers very indifferent about booking new business at even the increased rates, as they are well sold over the next couple of months. List rates are now £6 15s. for Lancashire, and £7 for North Staffordshire bars, delivered here. Sheets have experienced some improvement, and good ordinary qualities now average about £7 12s. 6d. to £7 15s. Hoops remain at £7 for random, to £7 5s. for special cut lengths, delivered Manchester district, with 2s. 6d. less for shipment.

Exceptional activity continues to prevail in the steel trade, and during the month there has been a further advance in prices, both for raw and manufactured material. Hematites now average 69s. 6d. to 70s., less 2½; local billets, £5 net cash; steel bars, £7 10s. to £7 15s. and £7 17s. 6d.; common steel plates, £7 15s. to £7 17s. 6d., with steel boiler plates about £8 12s. 6d., delivered here.

A brisk demand is reported for all descriptions of manufactured metal goods, and following the upward move in raw material, list rates have been advanced 1d. to 1½d. lb. all round, List rates, delivered Manchester district, are now as under:—Solid drawn brass boiler tubes, 8¼d.; solid drawn copper tubes, 10¼d.; brazed copper gas and steam tubes, 10¼d.; brazed brass tubes, 10½d.; common rolled brass, 7¾d. lb.

Returns as to operations in the timber trade of this district during the past year show that business has again been on a very extensive scale. The import was curtailed, and with a good consumption, stocks were slightly reduced. Prices in the early part of the year were depressed, but with advancing freights at the close of the season, and reduced imports, an improvement has taken place in some of the leading articles. The building and machine trades have been brisk throughout the year, and as the manufacturing, coal, and iron trades are also active, a continued good consumption is anticipated. Freights, which ruled low at the early part of the season, advanced sharply towards the close, but, judging from the low charters already made, there is a prospect of more moderate rates for the coming season. A large quantity of the import has gone directly to the Manchester Ship Canal, largely owing to the better facilities there provided for landing and dealing with steamer cargoes at present so extensively engaged in the wood trade. The accommodation provided by the Mersey Dock and Harbour Board in Liverpool has in recent years been greatly curtailed, and, it is stated, is now totally inadequate. This must have the effect of driving still more of the trade to the Manchester Ship Canal and neighbouring ports. The quantity taken to the canal last year was about 250,000 loads. The arrivals of teak were light as compared with the previous years import. Deliveries were satisfactory, and the demand continues fairly active. Consequently stocks are reduced to a moderate compass, and values are very firm. The import of greenheart showed a considerable falling off, whereas the consumption increased considerably, with the result that stocks are in fairly healthy condition. Prices were fairly well maintained, and are now firm.

The coal trade is in a very satisfactory position. The demand generally is active, and the advance in prices of 10d. to 1s. per ton, which was put on at the commencement of the year, has been well maintained. House fire coals are not meeting with any special pressure of demand, this being due to the exceptional mildness of the season; but there is plenty of business doing, and pits are kept on full time, with prices steady at the advanced rates. Steam and forge coals move away readily, with the output scarcely equal to the demand, and a strong tone as regards prices. For engine fuel there has been a very heavy demand, and there is a general scarcity of supplies throughout the market, with selling rates fully maintained on the new basis. At the pitmouth the revised quotations may be given as under:—Best Wigan Arley, 12s. to 12s. 6d.; Pemberton four ft. and seconds Arley, 10s. 6d. to 11s.; common house coal, 9s. 6d. to 10s.; steam and forge coal, 8s. 6d. to 9s.; engine fuel, 6s. 3d. to 6s. 9d. for best sorts; 5s. to 5s. 6d. for mediums; and 4s. 6d. for common slack.

Coke is in active request, with foundry qualities readily fetching 16s. at the ovens.

The shipping trade is tolerably brisk, with prices ruling somewhat higher, ordinary steam coal averaging 9s. 6d. to 9s. 9d. at Garston Docks; 9s. 9d. to 10s. High Level, Liverpool; and 10s. to 10s. 6d. per ton at the Partington tips, Manchester Ship Canal.

THAMES.

(*From our own Correspondent.*)

THEY have been working night and day in the offices of the Thames Iron Works Co., Limited, on the order of the two first-class battleships. This order will provide work for the workmen of West Ham for the next three years. The company have not only booked the order for the building of the ships, but they have obtained the order for the machinery as well. Up to now the company have only been engaged with small machinery, never before have they taken the engines for large battleships. There have been rumours abroad for some time that the company was casting about for space to set down large machine tools in order that they might cope with large work, and the end of it has been that the directors are concluding arrangements with Messrs. John Penn & Sons, of Greenwich, to take over their engineering works for heavy engine work.

The first-class battleships to be built by the Thames Iron Works, Limited, are of 14,000 tons and 18,000 H.P. The *Shikishima* and *Albion* are still having their fittings completed. The former, which is 14,850 tons and 14,500 H.P., is 400 ft. long, 75 ft. 6 in. in beam, and 27 ft. 8 in. draught, her speed is to be 18 knots. At the present time the company are completing an order for twelve life boats for the Life Boat Association Institution.

Messrs. R. & H. Green, Blackwall Yard, are fairly full up with repairs, and besides these they have in hand a composite lightship for the Honorable Trinity Corporation. A steel twin screw tug for the London and Indian Docks Joint Committee the dimensions of which are 90 ft. in length, 21 ft. beam, and 12 ft. depth, the engines will be 800 I.H.P. They have also six steel barges on the stocks.

A serious boiler explosion took place on Friday, the 6th January, accompanied by loss of life, at the works of Messrs. Hewett & Co., Barking Creek. The boiler which exploded was of the ordinary marine type, it was 10 ft. 8 in. diameter by 10 ft. long. It was built of three rings and had double rivetting along the joints. The end plates were stayed with longitudinal bolts with washers and external nuts. There were two furnaces, the tubes were metal and 3 in. diameter, and ½ in. thick. There was a brick chimney 75 ft. high. The damage to buildings and machinery was very great. The boiler-house was only defined by numerous bricks. Some of these bricks had been driven against the wall of the smith's shop and knocked it right in. The chimney had fallen on the roof of the machine and fitting shop, and wrecked the part on which it fell. The explosion had taken place along a line at the top of the boiler. Some of the plates were lying flat. The furnaces had been driven in and had yielded and bent without breaking. A piece of the end plate had been carried right into the air over tops of houses for a distance of 300 yards, and then gone through a roof and the floor of the room beneath, and had sunk into the earth of the floor beneath. The steam dome was lying in a field at a distance of 110 yards away from the site of the boiler. It is about 3 ft. by 3 ft., and weighed about half-a-ton. The shearing of the bath was at an angle and not at right angles to the bolt. The safety valve was lying to the left hand of the boiler at a distance of from 20 ft. to 30 ft. The boiler had been out of work for a year, and was being started to releave the regular one. It had been tried the year before to a pressure of 90 lbs., and was found all right. One of the killed and one of the injured was working on the boiler at the time, and five minutes before the explosion a new gauge just placed on showed a pressure of 16 lbs. The safety valve was set for 50 lbs., and it had been blowing off. A closer investigation shows that one of the furnaces had collapsed and had broken along the side. The explosion was clearly due to excessive pressure. The stop valves had not been opened, and there had evidently been accumulation of steam. It is possible the pointer of the gauge had gone right round, and was pointing at the low pressure shown to those employed at the boiler.

Thornycroft's Automatic Feed.—The automatic feeding of water-tube boilers has been discussed in one of the American technical journals. A case is taken. Suppose a water-tube boiler has 500 square feet of heating surface, the water contents are about 600 lbs. Should the evaporation be only 5 lbs. per square foot the whole of the water would be turned into steam in 15 minutes, and a very short turn indeed would be required to turn the water level. It is obvious that the feed apparatus must be such as to preserve the water level constant while the boiler is at work, and stop feeding when the boiler stops giving off steam. Of those reliable the Weir feed pump is very safe, and because of this it is often adopted in spite of other defects. In the Belleville boiler the feed is regulated by a float, which opens the feed regulating valve when the water level falls against the resistance by a spring which closes the valve as the float rises. Thornycroft's is almost perfect.

On the question of water-tube boilers in the Navy, the *Engineer* has the following:—"By degrees the troubles of the Belleville boiler are being got over, the addition of a feed water heater having done much to improve its performance; but enormous sums of money have been spent on its development, and we are disposed to think that a like expenditure on other types might have given a better return. Of tubulous boilers of the express type many are still undergoing trial. Very good results, indeed, have been obtained by Mr. Mumford with boilers which he has fitted in H.M.S. *Salamander*, and he is still improving on that type." Similar trials have been going on in France under M. Bertin, Chief Constructor of the French Navy. "They all worked well, and their efficiencies have been given—the Belleville boiler being taken as unity—as ·858 for D'Albert and the Niclausse as ·905 for steam-making; for economy D'Albert at 1·083 and Niclausse at 1·089." From which we gather that several English water-tube boilers have nothing to fear in the world's competition. Mr. A. G. Mumford has completed the trials of the boilers for torpedo boats 63 and 64. They were designed to accommodate themselves to the smaller space allowed and high efficiency required. The space taken up by the boiler is 9 ft. in length, 7 ft. in breadth, and 6 ft. in height. The heating surface is 850 ft., and the grate area 22 square feet. Her boiler was designed to give 400 I.H.P., but it gave much greater than that. When burning 25 lb. of coal on the grate the evaporation was 9.88 lbs. of water from feed at 58°; burning 50 lbs. the evaporation was 9·05; 75 lbs. the evaporation was 7·4 lbs.; and at 100 lbs. of coal the evaporation was 6·317, the feed in every case being at 58° Fah. By an ingenious arrangement the heat at the base of the chimney stack never became excessive.

BELFAST.

(*From our own Correspondent.*)

TWO launches took place during the month from the north yard of Messrs. Workman, Clark & Co., Limited. The first of these was a steel screw steamer named the *Stentor*, which has been built to the order of Mr. Alfred Holt, Liverpool, under the supervision of Mr. Henry Wortley, the owner's superintendent. Her dimensions are:—Length, 440 ft.; breadth, 52 ft. 6 in.; depth moulded, 53 ft. 6 in. This ship has been specially designed for Mr. Holt's general cargo trade, and has all requirements for a Board of Trade passenger certificate. A special feature in her is the total absence of all obstructions in her holds, the stanchions having been dispensed with and box girders substituted in their place, thus affording great facility for stowing machinery or other bulky freight. Five derricks, which will be worked by steam winches of the most improved type, have been placed at each cargo hatch, for the rapid discharge of cargo. Machinery capable of developing 3,600 I.H.P. is now being placed on board this ship, and it is expected she will take up her station at no distant date.

The second vessel, namely, the steel screw steamer *Yangtsze*, was launched from the same yard on Monday, January 16th. She is the first of two vessels in course of construction, and constitutes the sixth built by the same firm for the China Mutual Steam Navigation Co., Limited, of London. She has been built to Class 100 A 1 at Lloyd's, and carries a Board of Trade passenger certificate, and her dimensions are:—Length, 450 ft.; breadth, 53 ft.; depth, 35 ft. 3 in. There is a cellular double bottom, extending fore and aft, and the peaks are arranged for water ballast. A trimming tank is constructed in one of the after holds to suit either water ballast or cargo. Six cargo hatches have been provided for discharging the cargo, together with sixteen derricks, which will be worked by fourteen steam winches, having extra large whipping drums of special design. The forecastle and long bridge are also fitted for carrying cargo, whilst the captain, officers, and engineers will be accommodated in the deckhouses on top of the bridge deck, the Oriental crew being berthed in the poop. The machinery for the *Yangtsze* has also been constructed by Messrs. Workman Clark & Co., Limited, and consists of triple-expansion engines of large power, steam being supplied from two double-ended boilers having Howden's system of force draught.

At present the docks and wharfs here present an exceedingly busy aspect, there being no less than six new vessels getting fitted out, not to mention two or three old steamers which are undergoing extensive repairs.

NORTH-WEST OF ENGLAND.

(From our own Correspondent.)

Barrow.—The shipbuilding and marine engineering trades of this district remain very briskly employed in all departments, and the work in hand has been increased during the month by the new Admiralty order for a very fast first-class cruiser known as an improved *Powerful*. This gigantic cruiser will combine equal tonnage with the *Powerful*, while being armoured, and having engine power capable of being driven 23 knots an hour. This order, when added to the work already in the hands of Vickers, Sons & Maxim, at their Naval Construction Works, Barrow, brings up the tonnage under construction at this yard to no less than 103,000 tons. This includes H.M.S. *Vengeance* line of battleship, 14,000 tons, H.M.S. *Hogue*, *Euryalus* and *Amphitrite*, 11,000 tons each, the two former armoured, and the latter a protected cruiser, and now the improved *Powerful* of 14,000 tons. The company has also in hand a Japanese battleship of 15,000 tons; a Pacific Steam Navigation Co.'s liner, the *Ortono* of 7,000 tons; two British & African Steamship Co.'s steamers of 5,000 tons each, a Clan Line turret ship of 7,000 tons the *Clan Cumming*, and a steam yacht for Sir William Wills. The *Amphitrite* is now nearing completion, and will it is expected leave the docks at Barrow for her trial trip about the 28th of February. The Clan Liner *Clan Cumming* was launched on the 20th of January, and her place in the yard will be taken by the Japanese battleship which will require two of the old berths. The steam yacht for Sir William Wills will be launched on February 14th, and in all probability H.M.S. *Vengeance* will be launched on the high tide in the beginning of April. With so large a number of big orders on hand it has been found necessary to extend the shipbuilding yard, adjoining Walney Channel, and with this object a large plot of land embracing several acres is being acquired by Messrs. Vickers. When this addition is made to the yard it will be by far the largest—if it is not already so—shipyard in the kingdom, or in the world. Considerable extensions have been proceeding in the Naval Construction yard since its acquisition by its new owners, and it is quite evident there will be a much greater business done here in the future than in the past, as alongside the extensions being made means are being adopted to bring the yard up-to-date, and ensure economies in working which will be very advantageous to all concerned, and will make it possible for Messrs. Vickers to undertake a much greater volume of work than has hitherto been possible. A new electric installation has just been completed, by means of which the chief part of the machinery in the shipbuilding department will be driven, as well as the new machinery in the gun-mounting shop on the engineering side of the yard. The new gun-mounting department at the Barrow Works will soon be completed, and already a very large number of orders are in hand, which in themselves will ensure great activity in the early future in this branch. There is still a very great demand for new houses in Barrow, although builders are busy in erecting several hundreds of workmen's dwellings at the present time. A strike of joiners is threatened in the town for an advance in wages from 8½d. to 9½d. per hour, and a reduction in working hours from 54 to 49. As it is probable the masters will resist this application a strike is looked upon as inevitable, and this will have the effect of delaying the work of house building, and this in its turn will have the unfortunate effect of checking the industrial and commercial enterprise which is now observable in Barrow, and which in a short time is likely to result in the great growth of the working population.

West Cumberland.—There is a very brisk tone in the shipbuilding trade of West Cumberland, and especially is this the case at Workington, where Messrs. Williamson & Sons have in hand several small craft of various types. At Maryport there is a fair business doing, but Messrs. Ritson & Sons have not lately booked as full an order sheet as the capacity of their works would justify. They are, however, busy, and are proceeding on old-fashioned, well-timed lines in which they build ships and dispose of them wholly, or in sixty-fourths to shareholders who invest their money in shipping, and who, for the most part in the past have done well by their enterprise.

Shipbuilding Material.—The trade in shipbuilding material is receiving an impetus alike from local and general sources. Shipbuilders are not only in a position to place new orders with steel makers, but are for the most part in urgent need of deliveries to enable them to make progress with the work they have had in hand for some time. Makers are very fully sold forward, and are alive to the importance of increasing their make of plates, angles, sections, and other classes of ship steel, because there is not only a full and a growing demand for deliveries, but there are indications on every hand that the shipbuilding trade will be very busily employed for a long time to come, and particularly so in view of the fact that the acquisition of the Naval Construction Works by Messrs. Vickers will in all probability keep Barrow busy even in times when the actual demand for new tonnage is small, and when under other circumstances shipbuilding material would be a drug on the market. Barrow makers of steel have not only opened up a good direct trade with Barrow shipbuilders and engineers, but with builders at Belfast, on the Mersey, on the Clyde, the Thames, and the Tyne, as well as with the great dockyards. Barrow as a port stands well in the matter of cheap carriage by sea, and thus local makers can compete on favourable terms with other makers. It is also a noteworthy fact that Barrow steel has won for itself honourable mention and the highest approval from the Admiralty, Lloyd's, the British Corporation, and all other expert sources. The orders recently placed by the Admiralty for the building of battleships, first-class cruisers, &c., throughout the country has led to the placing of orders at Barrow with steelmakers for a heavy tonnage of steel of all descriptions, as well for shipbuilding as for marine engineering purposes. There is a very brisk enquiry for heavy steel castings, and the big foundries at Barrow are growing bigger and are being gradually fitted up to undertake the heaviest castings, and to deal with the highest analysis of metal required for the best classes of Admiralty and general work. Prices of steel shipbuilding material are improving, and it is probable before very long a marked increase in value will be noted. Heavy ship plates are at £6 17s. 6d. per ton net f.o.b., and light plates are at £7 17s. 6d. to £8 per ton; angles are at £6 12s. 6d. Heavy ship and engineering castings range from £20 to £28 per ton. A patent has been brought out by an ordinary artisan in Barrow for dealing with the manufacture of angle steel or angle iron at one fusion. He claims to have solved a great economic problem, whereby he taps the metal from the blast furnace, transfers it in ladles to the Seimens-Martin furnace, and there forthwith regulates by analysis its carbon and other necessary chemical conditions, after which it is poured into moulds which are allowed to set, but not cool, then, by reheating in ordinary gas furnaces to produce the angles in great lengths through the ordinary rolling mills. The patent is engaging the attention of several experts who claim that it has undoubted merit in it, and it is freely spoken of as an invention which is likely to be of great practical utility to the shipbuilding trade.

The Hematite Trade.—A very brisk business is being done in hematite qualities of pig iron, and the market is certainly more full of life than it has been for some time past. Much excitement, in fact, is shown not only amongst speculators but amongst makers, and prices have moved about very erratically. They now stand at 60s. per ton net cash sellers, 60s. buyers, and makers are asking 60s. for mixed Bessemer Nos. net f.o.b. It is felt that the inflation in the price of pig iron will result in an advance in the price of steel shipbuilding material. Stocks have increased since the beginning of the year by 10,000 tons and now stand at 185,964 tons. Forty furnaces are in blast, as compared with 41 in the corresponding week of last year.

Shipping.—Shipping is fairly busy, and is likely to remain so. The totals to date this year at West Coast ports represent: pig iron, 21,944 tons exported; steel, 22,288 tons; corresponding period of last year, pig iron, 24,653 tons; steel, 34,909 tons; decrease, pig iron, 2,709 tons; steel, 12,621 tons.

AN INTERESTING BREAKDOWN.

A NEW DEPARTURE FOR WHITE METAL.

MARINE ENGINEERS are often brought face to face with situations which require immense powers of resource and inventive ability to overcome the difficulties of any particular set of circumstances. Their faculties in this direction are particularly taxed in the case of a serious breakdown at sea. The means at their disposal are often inadequate to the magnitude of the work to be performed, and their labour is often made difficult and dangerous by the unsteadiness of the ship when left at the mercy of the wind and waves. History records many feats of pluck and daring which have been performed by denizens of the engine-room, sometimes against the greatest odds.

It is now our pleasure to describe and illustrate the repair to a breakdown which occurred on the steamer *Royal Prince*, of Knott's Line, when on a voyage to Alexandria, on June 28th, last year. The breakdown consisted of the fracture of the thrust-shaft between the collars, the parting being clean. As the vessel was only 40 miles from the coast and 120 miles from Alexandria, it was necessary that she should be got under way, and the repair completed as quickly as possible. The adjoining illustrations show the fracture and method of repair. Fig. 1 shows the two parts jointed together. Fig. 2 is a sectional view, showing the distribution of bolts and white metal.

The fractured ends of the shaft could not be drawn up to within $\frac{3}{8}$ in. of their original position owing to the chafed edges of fracture; and as there was not sufficient time to waste in chipping and fitting keys, a quick and, as far as we know, an entirely new method was adopted by the use of white metal. This new method was the means of getting the ship under way in probably less than half the time required when fitting keys in the usual way.

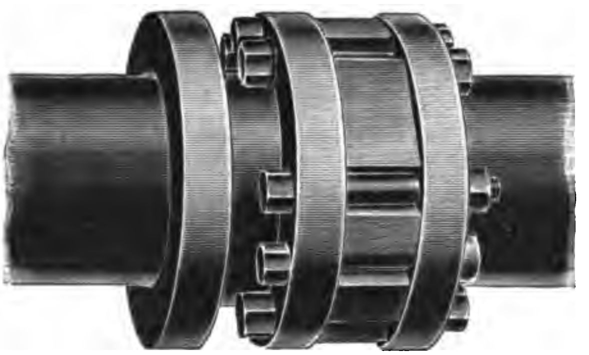


FIG. 1.

In the first place holes were drilled in the collars, and bolts with nuts at each end were fitted; then hardwood blocks were inserted between the collars and the bolts, and the spaces at the fracture and other parts was run up solid with metal, thus completing the repair. It will be seen from the illustrations that the metal filled up the spaces between the blocks under the bolts, thus forming a key for each bolt.

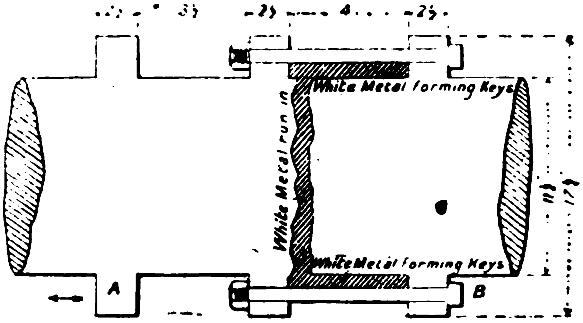


FIG. 2.

The total detention to the vessel from the time the accident happened, until she was steaming ahead again, was 51 hours; but if sufficient metal had been on board to run the spaces up solid where the hardwood was fitted, we understand the job could have been completed in 47 hours; the time occupied in fitting the blocks was four hours, whereas white metal could be run in in four minutes, or less. It will be generally conceded by those in a position to judge that this was a very ingenious, expeditious, and effective method of repair.

While on this subject of white metal we may mention some other convenient uses of the metal in this way. For instance, new neck-rings for piston-stuffing boxes can be installed in place in about two hours. This is done by lowering or removing the gland to any convenient part of the rod and setting it square thereon; an oiled tin sheet is then bound round the gland to form the external diameter of the neck-ring, and the part of the piston-rod which forms the internal diameter of the neck-ring is covered with a layer of note-paper to give clearance. When all is ready the white metal is melted and cast around the rod.

Another instance is in the repair of a steam-stop valve, in which the thread has been cut in the solid box for the spindle, and through wear has become worn away. First, the old thread is drilled out of the box, then the spindle is put properly into place, and the metal melted and run in; the thread is thus formed complete without any machine work, fitting, or tapping; and, furthermore, with this method you can ensure a true pitch of thread, which is no small matter, considering the difficulty that is often felt on board ship by not having taps to suit the different pitches and forms of threads that one has to contend with.

It is obvious that the same methods are applicable to the re-metalling of bearings and thrust-shoes, and for securing flanges to copper pipes which have become melted; in these cases the parts to be covered should be first tinned, and a flux, such as sal-ammoniac, used to form a junction between the white metal and the brass, gun-metal, or copper.

In conclusion, we would point out that often much time, trouble, and expense could be saved by calling to one's aid in the case of emergency the assistance of so controllable and convenient a material as white metal, and no doubt as time goes on many uses will be found for it other than those usually recognised. We cannot close this notice without adding our testimony as to the ready resource, ingenuity, and ability displayed by the engineers of the *Royal Prince* in overcoming the serious obstacles involved in the breakdown with such despatch and efficiency.

Miscellaneous.

Presentation to Captain and Crew of s.s. *Olive*.—A very interesting presentation took place on November 30th in the new offices of Messrs. Burnett Bros, & Sons, 14, Mincing Lane, owners of the s.s. *Olive* which rescued the survivors of the s.s. *Fitz James*, lost in the late gale in the English Channel, on November 24th, under circumstances already reported in the paper of that date. Mr. Walter Burnett, addressing the captain and crew, said how proud the firm were of the conduct of all on board, and called upon his brother Mr. Charles Burnett, to say a few words and make the presentation. Mr. C. Burnett after reading a letter from the coroner for Rotherhithe setting forth the particulars of the noble efforts made by the captain and crew of the *Olive* in effecting the rescues under such trying conditions, he called to the front Richard Green, able seaman of the *Olive*, and congratulated him on the heroic manner in which he dived overboard in a raging storm to save a poor fellow who was to far gone to grasp the rope thrown him, and also read to him the letters received from all parts of the country, and presented them to him with a purse of sovereigns subscribed by himself and friends in recognition of his bravery. Green, in reply, thanked him for his great kindness, and said that he did it on the spur of the moment, and was sorry the man succumbed to the exposure and injuries he received. Captain Holmes was next called, and after referring to his length of service with the firm, he (Mr. Burnett) thanked him for the manner he had brought the ship through the late terrific gale, and presented him with a sum of money as souvener of the occasion. Mr. W. J. Dibb, chief engineer, was next called and passed through the same ordeal, likewise every member of the crew down to the sailors and firemen. Several speeches followed, all referring in a flattering manner to the conduct of all on board the s.s. *Olive*. Captain Holmes, seconded by the chief engineer, responded on behalf of the crew, and thanked Messrs. Burnett, Bros. & Sons, and their friends for the many kind things they had said about them and also for the handsome manner they had acknowledged their humble services, and trusted they would try to do their duty in the future as they had in the past. Captain Holmes and crew then withdrew amidst the hearty cheers of all those present.

Institution of Naval Architects.—The annual meetings of this institution will take place on Wednesday, March 22nd, and the two following days, in the hall of the Society of Arts, John Street, Adelphi, W.C. (by kind permission of the Council). The Right Hon. the Earl of Hopetoun, G.C.M.G., President, will occupy the chair. The annual dinner will be given on Wednesday, March 22nd, at the Grand Hall, Hotel Cecil, Strand, W.C., at 7.15 p.m.

Marine Engineers' Examination.—At the quarterly examination of extra first-class engineers, held in January, Liverpool has come to the front again, and Messrs. James B. Wilkie and Michael J. Burke were successful. The two candidates passed the examination on their first attempt, and were prepared by Mr. Ellis L. Prichard, 8, Walton Road, Liverpool.

Important Decision.—In the Queen's Bench Division, before Mr. Justice Mathew and a special jury, the case of The Magnolia Anti-Friction Metal Company and Others *v.* Sugden, Atlas Metal Company, Limited, and others has been decided. Want of space prevents us giving full particulars, but the jury found that the defendants Brown, Watson, and Sugden conspired together to enable Sugden secretly to continue the manufacture and sale of anti-friction metal, after the termination of the contract; and agreed to form and use the names of the defendant companies, in furtherance of the conspiracy. The questions for the jury were:—(1) Whether the defendants Brown, Watson, and Sugden conspired together to enable Sugden secretly to continue the manufacture and sale of anti-friction metal after the termination of the contract; and (2) whether they agreed to form and use the names of the defendant companies, in furtherance of the conspiracy. The jury answered both questions in the affirmative.

Bethania.—On Thursday, January 26th, Messrs. Alex. Stephen & Sons launched, at Linthouse, a steel screw steamer, built to the order of Sir Christopher Furness, for the Hamburg America Co. The vessel has been built under special survey, class 100 A1, with many additions of extra strengthening for Atlantic trade. Her length is 500 ft., and she has a cubic measurement cargo capacity of nearly 20,000 tons. The upper and main decks are of steel, all fore and aft. There is a shelter deck extending all fore and aft, with special strengthening for Atlantic weather. This deck is fitted throughout with the most improved modern appliances and for carrying cattle. Further cattle space is provided on an upper bridge about 120 ft. long. The vessel will carry about 900 head of cattle in all. The accommodation for captain and officers is provided for in large deck houses on the upper bridge, while the seamen and firemen are located on upper deck forward, and the cattlemen on the same deck aft. The vessel has a cellular double-bottom all fore and aft, and also a deep ballast tank. The portion of double bottom under machinery space is sub-divided, and arranged for carrying fresh water for cattle, with all necessary pipes and connections, &c., for distribution throughout the attle spaces. The whole of the cargo compartments are fitted with grain divisions. Special care has been taken in the ventilation in all parts of the ship. No fewer than 14 powerful steam winches and 30 derricks are provided in order to secure the most convenient and rapid handling of cargo. Combined hand and steam steering-gear is fitted in house on the after-end of the shelter deck. Electric lighting is provided throughout the entire ship, which will, when completed, be one of the best equipped cargo and cattle steamers afloat. Her engines will have cylinders 30 in., 50 in., and 83 in., diameter by 60 in. stroke, with four boilers working at 180 lbs. pressure. The steamer, which is the second of two constructed to the order of Sir Christopher Furness, for the above Company, was named the *Bethania* by Mrs. Snissen, wife of Carl van der Snissen, who has superihtended the construction of the vessel. This is the twelfth vessel built by Messrs. Stephen to the order of Sir Christopher Furness.

Marine Engineers' Examination.—At the recent examination for extra first-class engineers, Mr. V. A. Jensen was one of the successful candidates. He was a student at Leask's Marine Academy, and passed the first time of going up, after only six weeks' tuition.

Woodford.—On January 26th Messrs. Ropner & Son, Stockton-on-Tees, launched a steel screw steamer of the following dimensions, viz.:—Length between perpendiculars, 315 ft.; breadth, extreme, 46 ft. 6 in.; depth moulded, 22 ft. 2 in. The steamer has been built to the order of the Britain Steamship Co., London, of which Messrs. Watts, Watts are the managers, and is of the three-decked rule, with one deck laid, having the builders' patent trunk, full poop, bridge, and topgallant forecastle. The saloon and cabins for captain and officers will be fitted in the poop, the accommodation for engineers is arranged in iron houses placed on the bridge deck amidships, and the crew will be berthed in the forecastle, as usual. She has double bottom on the cellular principle, for water ballast, and will carry about 4,000 tons deadweight on Lloyd's freeboard on a light draught of water. She will have direct steam windlass, steam steering gear amidships, with powerful screw gear aft, 4 large steam winches, a multitubular donkey boiler, stockless anchors, &c. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited, having cylinders 23 in., 38 in., and 62½ in., by 42 in. stroke; two steel boilers 15 ft. by 10 ft.; 160 lbs. working pressure. This is the 10th steamer built by Messrs. Ropner & Son for the same owners. As the steamer left the ways the name of *Woodford* was given to her by Miss Ropner, of Presto Hall.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Zulcika.—On December 13th there was launched at Sunderland for Messrs. Turner, Brightman & Co., of London, a steel schooner-rigged steamer of about 3,755 tons gross, named the *Zuleika.*

Sir Galahad and **Sir Lancelot.**—On December 14th there was launched at North Shields, for Grimsby owners, two steel ketch-rigged steamers of about 154 tons gross each, named the *Sir Galahad* and *Sir Lancelot.*

Auckland.—On December 15th there was launched at Hull, for the Hull Steam Fishery & Ice Co., Limited, of Hull, an iron steam ketch of about 155 tons gross, named the *Auckland.*

Belovar.—On December 17th there was launched at Hull, for Mr. A. Black, of Grimsby, an iron steam ketch of about 190 tons gross, named the *Belovar.*

John.—On December 17th there was launched at Whitby, for Mr. J. Constant, a steel steam barge of about 310 tons gross, named the *John.*

Stoic.—On December 19th there was launched at Hull, for the Grimsby Steam Fishing Co., Limited, of Grimsby, a steel ketch-rigged steamer of about 208 tons gross, named the *Stoic.*

Muristan.—On Tuesday afternoon, December 27th, there was successfully launched from the shipbuilding establishment of Messrs. Wood, Skinner & Co., Limited, at Bill Quay, Newcastle, a beautifully modelled steel screw steamer, which has been built to the order of Messrs. Frank C. Strick & Co., Limited, of London. The principal dimensions of the vessel are as follows, viz.:—Length, 306 ft.; beam, 43 ft.; depth moulded, 20 ft. 10 in. The vessel is intended for the Persian Gulf trade, and is an exceptionally fine specimen of the modern cargo steamer. She is of the partial awning deck type, with poop aft, and long raised quarter deck, and will be rigged as a fore-and-aft schooner, with telescopic topmasts. The vessel will be fitted with all the latest improvements and appliances for facilitating the rapid loading and discharging of cargo and for general working. She has been built to Lloyds' highest class, viz., 100 A1, and has also been inspected during construction by Mr. A. Walker, of London, the owner's surveyor. The saloon and captain's and officers' accommodation is in the poop, aft; the engineers' quarters being under the partial awning deck, amidships, with chart-room and wheel-house above; while the crew are berthed under the awning deck, forward. Water ballast is provided in the cellular double bottom, all fore and aft. The engines, which have been constructed and will be fitted by the North-Eastern Marine Engineering Co., Limited, at the Northumberland Engine Works, Wallsend, are of the improved triple-expansion type, having cylinders 23 in., 38 in., and 61 in. diameter respectively, with a stroke of 39 in., and will be supplied with steam from two large boilers working at 160 lbs. pressure per square inch. The machinery has also been constructed to the requirements and under the special survey of Lloyd's for their highest classification. As the vessel left the ways she was named *Muristan* by Mrs. William Wood, of Newcastle-on-Tyne.

North Lyell.—On December 28th Sir W. G. Armstrong, Whitworth & Co., launched from their Walker shipyard the twin screw passenger steamer *North Lyell*, built to the order of the North Mount Lyell Copper Co., Limited, and intended to trade between Macquarie Harbour, on the west coast of Tasmania, and Melbourne. Her principal dimensions are:—Length over all, 310 ft.; length between perpendiculars, 300 ft.; breadth, extreme, 40 ft. 8 in.; depth moulded, 22 ft. 6 in. Her propelling machinery consists of two sets of four-crank triple expansion engines, balanced on the Yarrow, Schlick and Tweedy system, each set driving a three bladed bronze propeller. The boilers are designed for a working pressure of 180 lb., and are arranged to work under forced draught.

Orah.—On December 28th there was launched at Newcastle, for Messrs. Elder, Dempster & Co., a schooner rigged steamer, of about 2,710 tons gross, named the *Orah.*

Prah.—On December 28th Messrs. Dobson & Co. launched, at Low Walker-on-Tyne, a steel screw steamer which they have built to the order of the African Steamship Co. (Messrs. Elder Dempster & Co.), of Liverpool. The vessel is of the shelter deck type, the dimensions are:—Length, 325 ft.; breadth, 45 ft.; depth, 22 ft. 2 in. The propelling machinery is being constructed by the Wallsend Slipway & Engineering Co., Limited, and consists of a set of triple expansion engines, having cylinders 23 in., 37 in. and 60 in. diameter and 42 in. stroke, steam being supplied by two single ended boilers working at 160 lbs. pressure. The steamer was christened *Prah.*

Afghanistan.—On December 28th Messrs. Short Brothers, Sunderland, launched from their works a fine modelled vessel for the Hindustan Steam Shipping Co., Limited, of Sunderland. The vessel has been built of steel, under special survey to the highest class in Lloyds' Register, and is of the following dimensions, viz.:—Length, 352 ft.; breadth, 45 ft.; depth moulded, 27 ft. 9 in.; the carrying capacity being 5,800 tons deadweight. Special attention has been given to the arrangement of upper and main decks, so as to enable a large number of cattle to be carried, suitable ventilation, &c., being fitted. The erections on deck consist of full poop, long bridge-house amidships, and topgallant forecastle, the saloon, captain's, officers', and engineers' accommodation being fitted in commodious houses on the bridge deck, with chart and wheel-house on the flying bridge. The steam steering gear is fitted in engine-room, with controlling rods from wheel-house on flying bridge. The double bottom is constructed on the cellular system, sub-divided into trimming tanks for water ballast. The holds are four in number, powerful steam winches being fitted, steam for which is supplied by a large multitubular donkey boiler placed in the stokehold. She is fitted with all the latest appliances for the economical and quick loading and discharging of cargoes. The vessel will be supplied with triple-expansion engines by Messrs. John Dickinson & Sons, Limited, of Sunderland, having cylinders 24½ in., 40 in., and 66 in. diameter, with a stroke of 45 in., steam being supplied by two large steel boilers working at 180 lbs. pressure, fitted with Howden's forced draught and all recent improvements for the economical working of the engines. On leaving the ways the vessel was named *Afghanistan*, the ceremony being gracefully performed by Mrs. Garcia, of Sunderland.

Barton.—On Wednesday, December 28th, Messrs. Wm. Gray & Co., Limited, launched a large steel screw steamer built to the order of Messrs. Webster & Barraclough, of West Hartlepool. She will take the highest class in Lloyd's, and is of the following dimensions, viz.:—Length over all, 341 ft.; breadth, 47 ft.; depth, 27 ft. 4 in.; with poop, long bridge, and forecastle. The saloon, state rooms, captain's, officers', and engineers' accommodation will be in large deck-houses on the bridge, and the crew's berths in the forecastle. The hull is built with deep frames, large hatchways are fitted, six steam winches, steam steering gear amidships, and hand screw gear aft, patent direct steam windlass, patent donkey boiler, cellular double bottom for water ballast, shifting boards throughout, stockless anchors, telescopic masts with fore and aft rig, boats on beams overhead, and all requirements for a first-class cargo steamer. Triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, having cylinders 25 in., 40 in., and 65 in. diameter, with a piston stroke of 42 in., and large steel boilers for a working pressure of 160 lbs. per square inch. The vessel and machinery have been constructed under the superintendence of Mr. Donald Ross, on behalf of the owners. The ceremony of naming the vessel *Barton* was gracefully performed by Miss Cissy Barraclough, of Seaton Carew.

Gorsemore.—On Wednesday, December 28th, Messrs. Richardson Duck & Co., launched from their yard a steel screw steamer of the following dimensions:—Length, overall, 342 ft.; breadth, extreme, 46 ft.; depth, moulded, 26 ft. 9 in.; tonnage, gross, 3,070 tons. This vessel, which has been built to the order of Messrs. W. Johnston & Co., Limited, of Liverpool, will take the highest class in the British Corporation Register, and has been built under special survey. She is of the single-deck type, with short poop aft, long bridge amidships, with engineers accommodation in houses alongside casing, captain and officers being berthed in a large house on bridge deck, and crew in topgallant forecastle. A cellular double-bottom throughout and peaks are fitted for water ballast, and equipment includes 6 steam winches, large multitubular donkey boiler by Blair & Co., Limited, steam windlass, stockless anchors, steam-steering gear, double derricks to all hatches, &c., &c. The engines by Messrs. Blair & Co., Limited, are triple-expansion, having cylinders 22½ in., 39½ in. and 67 in. by 42 in. stroke, steam being supplied by 2 single-ended boilers with a working pressure of 200 lbs. The vessel was named *Gorsemore*, being No. 500 in the builders' yard.

Greenwich.—On December 28th Messrs. Ropner & Son, Stockton-on-Tees, launched a steel screw steamer of the following dimensions, viz.:—Length, between perpendiculars, 315 ft.; breadth, extreme, 46 ft. 6 in.; depth, moulded, 22 ft. 2 in. The steamer has been built to the order of The Britain Steamship Co., London, of which Messrs. Watts, Watts & Co., are the managers, and is off the three-decked rule, with one deck laid, having the builders' patent trunk, full poop, bridge, and topgallant forecastle. The saloon and cabins for captain and officers will be fitted in the poop, the accommodation for engineers is arranged in iron houses placed on the bridge deck amidships, and the crew will be berthed in the forecastle as usual. She has double bottom on the cellular principle for water ballast, and will carry about 4,500 tons deadweight on Lloyd's Freeboard, on a light draught of water. She will have direct steam windlass, steam-steering gear amidships, with powerful screw gear aft, 4 large steam winches, a multitubular donkey boiler, stockless anchors, &c., &c. She will be fitted with a set of triple-expansion engines by Messrs. Blair & Co., Limited, having cylinders 23 in., 38 in., and 62½ in. by 42 in. stroke, two steel boilers 15 ft. by 10 ft., 160 lbs. working pressure. This is the ninth steamer built by Messrs. Ropner & Son, for the same owners. As the steamer left the ways the name of *Greenwich* was given to her by Mrs. H. Holder, of Birmingham.

Newcastle.—On December 28th there was launched from the West yard of C. S. Swan & Hunter, Limited, Wallsend, a steel screw steamer, built to the order of Messrs. J. J. & C. M. Forster, of Newcastle. The principal dimensions are:—Length, overall, 341 ft.; breadth, extreme, 48 ft.; depth, moulded, 26 ft. 6 in. This vessel has been built to Lloyd's three-deck rule, having one deck laid, deep girder framing, and has a bridge, poop and forecastle, the deadweight capacity being 5,500 tons on a moderate draught. The arrangements for the quick discharge of cargo are very complete, the vessel being fitted with 7 steam winches, derricks on the masts and on derrick posts. She is specially well provided with water ballast, having a complete cellular double-bottom, besides a deep tank in the after hold and the fore and after peaks. She is also fitted with shifting boards, &c., to comply with the Grain Act. The engines have been built by the North-Eastern Marine Engineering Co., Limited, the cylinders being 24 in. by 40 in. and 64 in. in diameter, with a stroke of 42 in. The boilers are 15 ft. 3 in. in diameter by 10 ft. 6 in. long, and the working pressure is 170 lbs. On leaving the ways the vessel was named the *Newcastle* by Mrs. J. J. Forster. Messrs. C. S. Swan & Hunter, Limited, are building a duplicate vessel for the same owners, which is in an advanced state of construction.

Stanfield.—On December 29th there was launched at Sunderland, for Messrs. J. Brown & Son, of Liverpool, a schooner rigged steamer of about 3,372 tons gross, named the *Stanfield*.

Degama.—On December 29th, Furness, Withy & Co., Limited, launched from their Middleton Shipyard, Hartlepool, a large steel screw steamer, built to the order of Messrs. Elder, Dempster & Co., Liverpool. She is a fine type of a modern cargo boat measuring over 350 ft. in length, and built throughout of Siemens-Martin steel with a large measurement and deadweight capacity, and built to the highest class at Lloyd's. The vessel is of the spar-deck type, with poop, bridge and topgallant forecastle, and arrangements fitted for carrying cattle on deck. The holds are fitted with iron grain divisions, and all decks, deck erections, skylights, bulwarks, bulkheads, &c., are constructed of steel and iron. Cellular bottom fitted all fore and aft for water ballast. The greater portion of the plates are in 24 ft. lengths, making the structure of the ship very strong. Six steam winches, donkey boiler, patent steam-steering gear amidships, screw gear aft, direct steam patent windlass, stockless anchors, hauling into hawse pipes and other modern appliances are fitted for the handling and working of the vessel. The saloon and cabin providing accommodation for the captain, &c., is handsomely finished in polished hardwood. The steamer will be rigged as a two-masted fore and aft schooner, and has been constructed under the supervision of Captain Evans and Mr. F. Smith. She will be fitted with triple-expansion engines by Messrs. T. Richardson & Sons, Limited, Hartlepool. On leaving the ways the vessel was gracefully christened *Degama*.

Saint Andrew.—On December 29th there was launched from the East Yard of C. S. Swan & Hunter, Limited, in the presence of a numerous company, a handsome twin-screw steamer which has been built to the order of Messrs. Rankin, Gilmour & Co., of Liverpool, for their Atlantic trade. The principal dimensions of the vessel are:—Length over all, 483 ft.; breadth, extreme, 56 ft.; depth, moulded, 34 ft. 10 in. She has been built to Lloyd's highest class, to the three-deck rule, with deep girder framing, high 'tween decks, and a complete shelter deck which has been specially ventilated and fitted with the latest appliances for carrying horses and cattle. She is of a fine model, and is fitted with powerful twin-screw engines capable of maintaining an average speed of 12 knots an hour. The arrangements for water ballast have received special consideration, there being two capacious deep tanks, besides a complete cellular bottom; both peaks are also fitted for carrying water. The cargo appliances are very powerful there being 12 winches and 21 derricks, besides cargo spans, &c. She has a large saloon house for the accommodation of the captain and officers, besides other houses for the engineers and petty officers, &c. The machinery has been constructed by the Wallsend Slipway & Engineering Co., Limited, and consists of two sets of triple-expansion engines having cylinders 22 in., 37 in., and 61 in. in diameter with a stroke of 48 in. The boilers are 18 ft. 3 in. in diameter by 12 ft. long, having a working pressure of 180 lbs., and are fitted with Howden's system of forced draught. On leaving the ways the vessel was named *Saint Andrew* by Mrs. Rankin, of Liverpool.

Beechnore.—On December 30th Messrs. Wm. Doxford & Sons, Limited, launched from their yard at Pallion the steam screw turret deck steamer *Beechnore*, which has been built to the order of Messrs. Johnson & Co., Limited, Liverpool, under the British Corporation's special survey. She has a weight-carrying capacity of 5,390 tons, and is fitted with triple expansion engines, having cylinders 21¼ in., 37 in., 62 in. and 45 in. stroke, and two boilers 12 ft. 6 in. by 11 ft. 6 in., working at a pressure of 280 lbs., with Howden's forced draught.

Rhodesia.—On December 31st there was launched at Hull, for the Hull Steam Fishing & Ice Co., Limited, of Hull, a steam ketch of about 155 tons gross, named the *Rhodesia*.

Riversdale.—On Jan. 10th there was launched from the works of Earle's Shipbuilding & Engineering Company, Limited, at Hull, the steam trawler *Riversdale*, built for the Sovereign Steam Fishing Co., Limited, Grimsby. The naming ceremony was performed by Mrs. F. Stennett, of Grimsby. This is the third vessel constructed for this company by Messrs. Earle's.

Spiteful (H.M.S.).—On January 11th H.M.S. *Spiteful*, the 50th ship built by the Palmer's Shipbuilding & Iron Co., Limited, for the British Government, was launched from their Jarrow yard. The ceremony was performed by Miss Evelyn May Palmer, daughter of Mr. A. M. Palmer, one of the directors of the company. H.M.S. *Spiteful* is a torpedo-boat destroyer, with a guaranteed speed of 30 knots per hour. She is the ninth boat of her class built by the Palmer's Company for the British Government.

John Coverdale.—On Thursday, January 12th, Messrs. Wm. Gray & Co., Limited, launched the large steel screw steamer *John Coverdale*, built to the order of Messrs. John Coverdale & Sons, of West Hartlepool. She is built to Lloyd's 100 A1 class and her dimensions are, viz.:—Length over all, 336 ft.; breadth, 47 ft.; and depth, 24 ft. 10 in. The deck erections consist of a full poop, long bridge and topgallant forecastle. The saloon and captain's and officers' rooms will be fitted under the poop. The hull is built with deep frames, and cellular double bottom for water ballast. Five steam winches, steam steering gear amidships, and screw gear aft, patent direct steam windlass, two donkey boilers, grain divisions, stockless anchors, and a complete outfit will be fitted for a first-class cargo boats. Three cylinder triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited. They will develop over 1,200 H.P. The cylinders are 24 in., 38 in., and 64 in. diameter, with a piston stroke of 42 in., and large steel boilers constructed for a working pressure of 160 lbs. per square inch. The hull and machinery have been built under the superintendence of Mr. Airey on behalf of the owners, and the ceremony of christening the steamer *John Coverdale* was gracefully performed by Miss Coverdale, of Hartlepool.

Kum Sang.—On Thursday, January 12th, Sir Raylton Dixon & Co., Limited, launched from their Cleveland Dockyards, Middlesbrough, a fine steel screw steamer built to the order of Messrs. the Indo-China Steam Navigation Co., London, for their trade in the Eastern Seas, being the fourth vessel built by Messrs. Dixon for the Company. She is built to Lloyd's highest class, spar deck rule, her principal dimensions being: Length, 346 ft., by 43 ft. 2 in. beam, by 28 ft. 6½ in. depth moulded. The upper decks are all of teak, and she is handsomely fitted with accommodation on bridge, for first-class passengers, besides taking a large number of emigrants in 'tween decks. Triple-expansion engines will be fitted by Messrs. Thos. Richardson & Sons, Limited, having cylinders 24½ in., 40 in., 67 in. by 45 in., with two large single-ended boilers working at 180 lbs. pressure, and fitted with Howden's system of forced draught. On leaving the ways she was gracefully named *Kum Sang* by Miss Inga Raylton Dixon, daughter of the builder. The owners were represented at the launch by A. Cheyne, Esq., the secretary of the company, and Mr. Barritt, the resident inspector.

Lynalder.—On January 12th there was launched from the Southwick Yard of Messrs. Robert Thompson & Sons, a fine screw steamer specially designed for cargo and the cattle trade, and built to the order of Messrs. the Liver Shipping Co., Limited, of Liverpool. Her dimensions are :—Length, between perpendiculars, 340 ft. ; breadth, extreme, 45 ft. ; and depth, moulded, 25 ft. 9 in., and will carry about 5,200 tons on 21 ft. draft ; she is constructed with extra strength to obtain Lloyd's minimum freeboard for "three-deck" vessels. There is a cellular bottom and peaks for water ballast and divided into transverse and longitudinal divisions for trimming purposes. The accommodation for captain, officers and engineers being placed in large houses on the bridge deck, leaving the bridge and poop spaces clear for cargo if required, the crew are provided for in the topgallant forecastle. The cabins and saloon are tastefully designed in different shades of oak. There are five large cargo hatches with powerful steam winches and double derricks for rapid loading and discharging of cargo, steam steering gear being fitted at after end of engine room, with control shafting the wheel house on upper bridge. The vessel is fitted with all the most modern improvements for a first-class cargo and cattle steamer. The engines are by Messrs. the North-Eastern Marine Engineering Co., Limited, having cylinders 23 in., 39 in. and 65 in. by 42 in. stroke, and extra large boilers of 180 lbs. pressure. During construction the ship and machinery have been personally superintended by Messrs. Maxton & Sinclair, of Liverpool and Belfast. As the vessel left the ways she was gracefully christened *Lynalder* by Mrs. David, wife of the captain who will take command of the vessel.

Albany, U.S.S.—On January 14th, at the Elswick shipyard of Sir W. G. Armstrong, Whitworth & Co., the protected cruiser *Albany*, built for the United States Government, was successfully launched. Her dimensions are :—Length on the water line 330 ft., with an extreme beam of 43 ft. 9 in., whilst her draught on a trial displacement of 3,500 tons, is 16 ft. 10 in. The trial speed guaranteed by the contract is 20 knots. She will carry powerful armament, and will be engined by Hawthorn, Leslie & Co., Newcastle, with two sets of triple expansion engines, driving twin screws, the maximum I.H.P. being 7,500, at 160 revolutions per minute. The diameter of the high-pressure cylinder is 31 in., intermediate 46 in., and the low-pressure 70 in., the stroke of all being 30 in.

Feronia.—Lately Messrs. W. Harkess & Son launched from their shipyard at Middlesbrough a finely-modelled steel screw steamer, which has been built to the order of Mr. Charles Pile for the Neptun Steamship Co., of Bremen. The principal dimensions of the vessel are :—185 ft. between perpendiculars by 28 ft. 6 in. by 14 ft. 10 in. moulded. She takes Lloyd's highest class. Her engines are of triple expansion type, built by Messrs. MacColl & Pollock, of Sunderland, and are capable of driving her a speed of nine knots when fully laden. On leaving the ways she was named *Feronia* by Miss Beatrice Ridley, of Coatham.

King Arthur.—On January 14th Messrs. Hagerup, Doughty & Schofield, of Grimsby, launched from their shipbuilding yard the first steam fishing vessel built by them. The order for this vessel, which was named the *King Arthur*, was placed by the Monarch Steam Fishing Co., and this being a new firm, the *King Arthur* is the first boat that will sail for them. Her dimensions are :—Length, 104 ft. by 21 ft. by 21 ft. 4 in. She will be fitted with 50-H.P. engines, which will be made by Messrs. Hagerup, Doughty & Schofield.

Derwen.—On January 14th there was launched from the shipbuilding yard of Messrs. John Readhead & Sons, West Docks, South Shields, a new screw steamer which is the sixth built by them to the order of Messrs. W. H. & C. T. Jones, Cardiff. The vessel, which is 353 ft. long, 46 ft. 5 in. broad, and 27 ft. 4 in. in depth, is of the improved single-deck type, and classed 100 A1 at Lloyd's under special survey. She has cellular double bottom fore and aft for water ballast, and is fitted with all modern improvements for rapid loading and discharging of cargo, including iron shifting boards. The cabins are in the poop aft, and there is accommodation under the bridge for engineers, &c., the crew being in the topgallant forecastle. She has a large deadweight carrying capacity on a light draught. The steamer will be fitted with triple-expansion engines, also constructed by Messrs. John Readhead & Sons, having cylinders 24 in., 40 in. and 65 in. with 45 in. stroke, steam being supplied by two large steel boilers working at a pressure of 160 lb. per square inch. As the vessel left the ways she was named the *Derwen* by Miss Gwenllian Jones, daughter of Mr. Wm. Jones, of Cardiff, senior of the firm.

Egret.—On January 17th Messrs. Cochrane & Cooper, Limited, launched from their Grovehill Shipyard, Beverley, a new tank fishing vessel of the following dimensions—115 ft. 8 in. by 21 ft. by 11 ft. 6 in. depth of hold. The vessel, which was built to the order of Mr. T. Baskcomb, Grimsby, will be fitted with triple-expansion engines of 60 H.P., by Mr. C. D. Holmes & Co., Hull. Miss Woolnough, of Grimsby, named the vessel the s.s. *Egret*, and after the ceremony the company adjourned to the offices of the builders, where lunch was provided.

Ironclad.—On January 18th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel barge of the following dimensions—Length, over all, 68 ft. 6 in. ; beam, moulded, 13 ft. 2 in. ; depth amidships, 5 ft. 2 in., and with a carrying capacity of 70 tons, built to the order of Messrs. Cory & Sons, Limited, Erith, Kent, and is the third of an order for six. As she left the ways was christened *Ironclad* by Miss May Ounsworth, of Iver.

Lugger.—On January 20th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel barge of the following dimensions—Length, over all, 68 ft. 6 in. ; beam, moulded, 13 ft. 2 in. ; depth amidship, 5 ft. 2 in., and with a carrying capacity of 70 tons. She was built to the order of Messrs. Wm. Cory & Sons, Limited, of Erith, Kent, and is the fourth of an order of six. On leaving the ways she was christened *Lugger* by Miss May Ounsworth, of Iver.

LAUNCHES.—Scotch.

Khino.—On December 14th there was launched at Renfrew a steel steam trawler, named the *Khino*.

Roslin.—On December 24th Messrs. J. Duthie & Co., launched at Montrose, a trawler named the *Roslin*, 90 ft. by 19 ft. 9 in. by 10 ft. 8 in., gross tonnage 130, for Messrs. J. Lewis & Son, Aberdeen, who are to supply the engines. The firm have on hand ten other trawlers for Aberdeen, Fraserburgh, and Grimsby.

Sobral.—On December 26th there was launched from the yard of Messrs. Murdoch & Murray, a nicely modelled steel twin-screw steamer named *Sobral*, for passenger and cargo service on the River Amazon. The dimensions of the vessel are :—Length, 140 ft. ; breadth, 30 ft. ; depth, to promenade deck, 15 ft. The arrangement of the vessel differs somewhat from other vessels built for the same trade, inasmuch as all the staterooms are in one large deckhouse well forward, leaving a good promenade on either side. The bath-rooms, &c., are right aft on the quarters, on the promenade deck, and the engineers, pilots, &c., are in the same position on the main deck. The crew are berthed forward as usual. A complete installation of electric light is fitted on board by Messrs. Haddow & Co., of Glasgow. The vessel was taken to Glasgow to receive her machinery, which consists of two sets of compound surface-condensing engines of good power, these will be supplied by Messrs. Lees, Anderson & Co., of Glasgow.

Normanton.—On December 27th Messrs. A. Rodger & Co. launched at Port-Glasgow a steel screw steamer named *Normanton*, of 2,500 tons gross register, to carry 4,350 tons deadweight. The dimensions are:—Length, 314 ft.; breadth, 44 ft.; depth, 23 ft. 3 in., moulded. The machinery will be supplied by Messrs. Hall-Brown, Buttery & Co., Glasgow.

Almora.—On December 28th there was launched from the shipbuilding yard of Messrs. D. & W. Henderson & Co., Partick, a large steel screw cargo steamer, named the *Almora*, which they have constructed to the order of Messrs. MacLay & MacIntyre, Glasgow. This latest addition to the large fleet of vessels already owned by this firm is in length, 375 ft.; breadth, 30 ft.; with a depth of 28 ft. 8 in.; having a gross tonnage of 4,400 tons, and will be classed in Lloyd's 100 A1. She has been fitted with all the latest improvements to insure the rapid and safe working of the large cargo which she has been designed to carry, including seven powerful winches and also large derricks fitted at the hatches. Steam steering gear, by Messrs. Bow, MacLachlan & Co., Paisley, is fitted amidships; the saloon and officers' accommodation is on the fore end of bridge deck, and a chart-room and wheel-house house have been built above this with a bridge which will give every facility to the officers in the navigation of the vessel. A set of triple-expansion engines will be supplied and fitted by the builders, having cylinders, 25 in., 41 in. and 67 in. diameter by 4 ft. stroke.

Katoomba.—On December 28th the Ailsa Shipbuilding Co., launched at Troon, a steel screw steam yacht designed by Mr. G. L. Watson for Mr. Kenneth M. Clark, of Netherhill, Paisley. The dimensions are:—Length on load water line, 163 ft.; breadth, moulded, 24 ft.; depth, moulded, 14 ft. 5 in.; tonnage, 500 tons. The engines, which are by Messrs. Muir & Houston, Limited, Kinning Park Works, Glasgow, are triple-expansion, designed to drive the vessel at a high rate of speed. The yacht is beautifully designed, is fitted with electric light throughout and a system of hot water heating, and all other appliances. She was gracefully named *Katoomba* by Mrs. J. G. Clark.

Player.—On December 28th there was launched from the Irvine Shipbuilding Co.'s yard at Irvine a finely-modelled screw-steamer built to the order of the Player Steemship Co., Limited, Teignmouth, Devon. The vessel is built of steel to Lloyd's highest class, and is intended for the owners general trade. The dimensions are:—172 ft. by 27 ft. 9 in. by 12 ft. 9 in., moulded, and she has a deadweight carrying capacity of 700 tons. The deck machinery is of a very strong type for the speedy handling of cargo. The engines, constructed by Messrs. Campbell & Calderwood, Soho Works, Paisley, have cylinders 19 in., 42 in. by 24 in. stroke, steam is supplied from a steel boiler 12 ft. 9 in. by 10 ft. 6 in. working at a pressure of 130 lbs. The vessel, on leaving the ways, was named *Player*, by Mrs. Player, Victoria Terrace, Teignmouth.

Sirdar and Nile.—On December 30th Messrs. Mackie & Thomson launched at Govan the two steamers the *Sirdar* and *Nile*. The vessels are both of the following dimensions:—116 ft. 9 in. by 21 ft. by 12 ft. moulded, and will be fitted with triple-expansion engines by Messrs Muir & Houston, Limited. The *Sirdar* has been built to the order of Mr. James Leyman, jun., Hull; and the *Nile* to the order of Mr. Thomas Hamling, Hull. They were christened by Miss Florence Leyman, Hull, and Miss Myrie M. Houston, Dumbreck. The *Nile* is the 40th vessel launched by the firm during the year.

Conqueror.—On January 13th Messrs Hawthorns & Co., Limited, launched at Leith the first of three steam trawlers which they are at present building to the order of Mr. Thomas Devlin, jun. The vessel will be fitted with triple expansion engines and all the latest appliances for a first-class vessel of this description. This is the tenth vessel built for the same owner by this firm, and as she left the ways she was named *Conqueror* by Miss Devlin, daughter of the owner.

Leuctra.—On January 13th Messrs. Russell & Co. launched at Port Glasgow a steel screw steamer of 4,850 tons deadweight carrying capacity, named *Leuctra*, for Messrs. William Thomson & Co., St. John, New Brunswick. Length, 325 ft.; breadth, 45 ft. 6 in.; depth, 25 ft. 6 in. This is the sixth steamer built by Russell & Co. for the same owners. Triple expansion engines will be supplied by Messrs. Kincaid & Co., Greenock.

Highland Laird.—On January 16th Messrs. Robert Duncan & Co., Limited, launched from their yard at Port Glasgow a spar deck steel screw steamer, built to the order of Messrs. Raeburn & Verel, of Glasgow, but subsequently transferred to Messrs. H. & W. Nelson, of Liverpool, for their fast increasing fleet of cattle carrying steamers which ply between Liverpool and South America. The dimensions are:—376 ft. by 48 ft. by 29 ft., moulded, having two completely laid decks, with poop, bridge, and forecastle, accommodation for captain and officers being in houses erected on top of bridge, for crew in forecastle, and cattlemen in poop. There are six steel bulkheads dividing the different holds, and the bottom is divided into several ballast tanks capable of containing about 1,000 tons of water ballast. Main and 'tween decks will be fitted throughout for carrying large numbers of live cattle and sheep, while the holds will be fitted with an extensive refrigerating installation for preserving in a frozen state a great quantity of carcases. The deadweight is 6,500 tons, and the cubic capacity about 380,000 ft. The machinery, which is by Messrs. Rankine & Blackmore, Greenock, will be of the triple expansion type, having cylinders 26 in., 42 in., 69 in. by 48 in. stroke; three boilers, 14 ft. 3 in. by 10 ft. 6 in., 160 lb. working pressure. The vessel and her machinery have been built to the rules of the British Corporation. As she left the ways she was named *Highland Laird* by Mrs. William Nelson, wife of one of the owners, and was thereafter towed to Greenock to receive her machinery.

LAUNCH.—IRISH.

Yangtsze.—On January 16th at high water Messrs. Workman, Clark & Co., Limited, launched from their North shipyard a steel screw steamer named the *Yangtsze*. This is the first of two vessels under course of construction and is the sixth built for the China Mutual Steam Navigation Co., Limited, of London, by Messrs. Workman, Clark & Co., and she has been specially designed to suit their Eastern trade. The dimensions of the steamer are:—Length, 450 ft.; breadth, 53 ft.; depth, 35 ft. 3 in.; and she has been built to class 100 A1 at Lloyds, and has a Board of Trade passenger certificate. A cellular double-bottom extends right fore and aft, and the peaks are arranged for water ballast, a trimming tank is constructed in one of the after holds to suit either water ballast or cargo. There are six cargo hatches provided for the rapid discharge of cargo, with sixteen derricks suspended from the masts and craneposts, and having good overboard swings for depositing cargo on quays; these derricks are worked by fourteen steam winches, having extra large whipping drums and of special design. The captain, officers and engineers are accommodated in deckhouses on top of bridge deck, the oriental crew being berthed in the poop, and the petty officers are aft under bridge deck. The forecastle and long bridge are fitted for carrying cargo. The machinery has been constructed at the builders' engine works, Queen's Road, and consists of triple-expansion engines of large power, with steam supplied from two double-ended boilers, having Howden's system of forced draught. An auxiliary boiler supplies steam for all deck machinery. A numerous company assembled to witness the launch, including Mr. W. A. Gulland, managing director of the China Mutual Steam Navigation Co., Mr. J. C. Smith, of Nagasaki, and Captain Hogg, the owners' marine superintendent.

LAUNCH.—GERMAN.

Varzin.—On Saturday afternoon, December 17th, the s.s. *Varzin* was launched from the yard of the Flensburg Shipbuilding Co. The dimensions are:—Length, 403 ft. 8 in.; breadth, 47 ft. 8 in.; depth, 31 ft., and she is a duplicate of the s.s. *Meissen* and *Bielefeld*, all built to the order of the Deutsch Australische Dampfschiffs Gesellschaft, in Hamburg. The vessel will be classed at Lloyd's 100 A1, spardeck rule, carry 6,500 tons, and fitted with powerful steam winches, steam windlass, steam steering gear, and all modern improvements for a cargo boat. The engines are being constructed also by the Flensburg Shipbuilding Co., the cylinders being 28½ in., 47½ in. and 78 in. by 65 in. stroke. During the construction of the vessel and the machinery, the work has been superintended by Mr. Timann and Mr. Eckelt, the company's marine and engineering superintendents. The christening ceremony was performed by Miss Helene Christophersen.

TRIAL TRIPS.

Moravian.—On December 20th the new steamer *Moravian*, which has been built and engined by Messrs. Robert Napier & Sons, Govan, for Messrs. George Thomson's service between London and Australia (of which we gave full particulars in our launch columns, November issue, page 332), went down the Firth on her official trial trip, several runs were made on the measured mile, and these were most satisfactory, the mean speed arrived at being 15¼ knots, while 14¾ only was guaranteed.

Broadgarth. — On December 21st the screw steamer *Broadgarth*, built by Messrs. R. Craggs & Sons, Middlesbrough, for the Clapham Steamship Co., Limited, Newcastle, left the Tees for her official trial trip. The dimensions of the vessel are:—Length, overall, 330 ft.; breadth, 47 ft.: and her deadweight carrying capacity is 4,450 tons. The engines have been supplied by the North-Eastern Marine Engineering Co., Limited, Wallsend-on-Tyne, and are 24 in., 40 in., and 64 in., by 42 in. stroke, with two large boilers working at 160 lb. pressure. During the trial they worked to the satisfaction of all concerned, driving the vessel at a speed of 11¼ knots. The *Broadgarth* afterwards proceeded to the Tyne to load.

Haiching.—Following upon the builders' preliminary trials for speed, adjustment of compasses, &c., on Tuesday, December 20th, the above-named steamer left the Tail of the Bank on Wednesday morning, December 21st, to undergo her official trial. The new steamer, which has been built by Messrs. David J. Dunlop & Co., engineers and shipbuilders, Inch Works, Port Glasgow, to the order of the Douglas S.S. Company, Limited, of Hong Kong, is of the following particulars. viz.:—Length on load water line, 280 ft. 4 in.: breadth moulded, 38 ft.; depth moulded to spar deck, 25 ft.; deadweight cargo on trial, 2,200 tons; guaranteed speed loaded with above deadweight on a four hours' continuous run, 11 knots per hour. The *Haiching* is intended for trading on the China coast, and has been fitted out and completed in the style usual for this service. Besides having been built under Lloyd's special survey for 100 A 1 Class, the vessel is provided with Board of Trade passenger certificate for twelve months, to obtain which all the most efficient life-saving appliances and navigating instruments have been provided. Fore and after peaks and cellular double bottom, sub-divided, have been provided for trimming and ballasting the vessel, the tanks under the engines and cross bunkers respectively being adapted for carrying fresh water for feeding the boilers. Under the boilers no tanks are fitted, the bottom framing being of iron, and the spaces in the vicinity of boilers being specially cemented to prevent corrosion. The rig is that of a two-masted fore and aft schooner, awnings being fitted throughout, the shade deck aft over first-class passenger accommodation having double awnings. Accommodation is provided in a large teakwood deckhouse in the after part of the vessel for first-class European passengers, and comprises a large saloon at the forward end, the whole width of deckhouse, handsomely finished in solid oak framing, French polished, no veneering being employed, capable of dining comfortably 22 persons, and furnished with oak revolving chairs, which, together with the sofas, are upholstered in morocco, dining tables, punkahs, sideboards, mirrors, fireplace, and carved overmantels, &c. Sliding venetian and glass windows with curtains, solid oakwood doors and venetian doors. commodious state rooms for ladies and gentlemen, with all the most modern accessories, Hoskins' folding-up iron berths, fold-up lavatories, &c., included, are fitted up on each side of the central passage leading from after part of saloon to stern, and the various conveniences include w.c.'s, bath rooms, marble baths with hot and cold water supply, pantry, store room, &c. Cabins for native passengers are fitted up under the spar deck. forward and aft, the berths also being supplied for these quarters by Hoskins. The space under the bridge deck in the alley ways, next ship's side, is apportioned for stewards' and servants' quarters on the starboard side, the port side being fitted up with officers' w.c.'s, store rooms, lamp room, &c. The central position of the space contains large European galley, crew's ditto, and firemen's ditto, whilst at the forward end under the bridge, in the centre of the ship, are placed two large staterooms, one for chief engineer and one for chief officer, fitted up in a manner at least equal to that of the first-class state rooms. In a teak deckhouse on the forward part of bridge deck a large state room is comfortably arranged for captain, and abaft of this is a suitably fitted-up chart room, in which is placed a standard compass. The junior officers are accommodated under the after part of forecastle, and the crew and firemen immediately forward of this. Throughout the vessel the greatest care has been exercised, and due attention paid to the subject of lighting and ventilation, which is most complete. This steamer has been fitted with a complete installation of electric light by Messrs. Claude Hamilton, Limited, and during a protracted trial gave complete satisfaction. The deck machinery includes Messrs. Clarke, Chapman & Co.'s steam capstan windlass and steam winches and Messrs. Bow, McLachlan's steam steering gear, whilst for the safe navigation of the vessel Lord Kelvin's compass and sounding machine are provided. The propelling machinery consists of one set of triple expansion engines, having cylinders 22 in., 35 in., and 57 in diameter, by 39 in. length of stroke, with two large single ended boilers and an auxiliary boiler. The air pump is of the "Edwards" patent type, and a vacuum of 29 in. was obtained throughout the trial. The circulating pump, with silent compound motor is by Messrs. Redpath & Paris. Taking the mean of two runs on the measured mile at Skelmorlie the steamer attained the speed of 11·862 knots, being about seven-eighths of a knot over the guarantee. Thereafter the *Haiching* was headed down the Firth, and the company adjourned to the saloon for dinner. Mr. Dunlop occupied the chair, and amongst those present were Mr. Adamson, of Messrs. William Adamson, owners' London agents; Mr. Dudgeon, consulting engineer, London; Mr. W. F. McIntosh, acting superintending engineer for the owners during the vessel's construction; Captain Hodgins, commander of the steamer, &c. After dinner was served Mr. Dunlop proposed success to the *Haiching*, and in coupling the toast with the name of Mr. Adamson expressed the hope that the steamer would prove herself a remunerative addition to the fleet of the Douglas S.S. Co., and pointed out that she not only showed a substantial margin in excess of speed, but that her carrying capacity on the guaranteed draft was considerably to the right side. Mr. Adamson, in replying, thanked the builders for the care and attention in fulfilling the contract, and on behalf of the owners expressed satisfaction at the results obtained, not alone for the ample margin in speed and deadweight, but for the general finish and equipment of the new steamer. In proposing the toast of the firm David J. Dunlop & Co., Mr. Adamson concluded by saying that it would afford him the greatest pleasure to renew the business relations with the firm should occasion arise, as during the construction of the *Haiching* those had been of the most pleasant description. Other toasts followed, and the steamer was berthed in the James Watt Dock to receive the balance of coal ere proceeding on the voyage to Hong Kong in the course of a few days.

Osborne.—On December 22nd the s.s. *Osborne*, built by C. S Swan & Hunter, Limited, to the order of Messrs. Raeburn & Verel, of Glasgow, was successfully tried off the Tyne, when a mean speed of 11 knots was obtained. The vessel has been built under the rules and supervision of the British Corporation, and is of the following dimensions:—Length over all, 387 ft. 6 in.; breadth, extreme, 48 ft.; depth, moulded, 29 ft. She has a bridge, poop, and forecastle, with large deadweight and measurement capacity, and has been specially designed for carrying bulky cargo, consequently the holds and 'tween decks have been kept as free from obstruction as possible, the pillars being wide spaced and of channel section, with strong girders running under the decks; besides, the hold stringers have been made of as small a breadth as practicable consistent with strength. The engines have been built by the Wallsend Slipway and Engineering Co., Limited, the diameter of cylinders being 26 in., 42 in., and 69 in., with a stroke of 48 in., steam being supplied by two boilers working under a pressure of 160 lbs. per square inch, and fitted with Howden's system of forced draught. On the trial the engines worked with perfect smoothness and with an ample command of steam. The owners were represented by Mr. Thomson, their superintending engineer.

Arcturus.—On December 24th the official trials of this steamer, being the third which Messrs. Gourlay Brothers & Co. have recently constructed for the Finska Steam Navigation Co., of Finland (of which we gave particulars in our launch columns, November issue, page 332) took place. The trials were completely successful, the contract speed of 15 knots per hour, fully loaded, being exceeded during a continuous run of over 13 hours at full power.

Corby Castle.—On Tuesday, December 27th, the s.s. *Corby Castle* was taken out of the Wear on her trial. The vessel has been built by Messrs. Wm. Pickersgill & Sons, Southwick, and engined by Messrs. Geo. Clark, Limited, Southwick, to the order of Messrs. Jas. Chambers & Co., of Liverpool (full particulars of which we gave in our Launch columns, January issue, page 427). After having her compasses adjusted the vessel had a run, and everything worked throughout in a highly satisfactory manner, after which the vessel proceeded to Newport, Mon., to load a cargo for Colombo.

Athena.—On January 9th the steamer *Athena* (of which we gave full particulars in our launch columns, December issue, page 371), left the shipbuilding yard of Messrs. Short Brothers, for trial trip, which proved in every way very satisfactory. After adjusting compasses a series of runs was made over the measured mile, and a mean speed of 12 knots was attained. After the trial trip the vessel proceeded to Cardiff to load for the River Plate, under the command of Capt. Jones.

Prince Arthur.—On January 9th the steamer *Prince Arthur*, which has been built at Hull by Earle's Shipbuilding Co., for the Dominion Railway Co. (of which we gave full particulars in our launch columns, August issue, page 208), went down the River Humber for her trial trip, the measured mile being run off Withernsea. This steamer has been built for running between Boston and Yarmouth (N.S.), and she has been fitted with engines of 6,080 H.P. Upon the test being made off Withernsea a speed of over 19 knots was obtained, the guarantee being thus exceeded. The gross tonnage of the *Prince Arthur* is 2,040.

Auckland.—On January 9th a new steam fleeter for the Hull Steam Fishing & Ice Co., Limited, named the *Auckland*, went for her official trials. The hull of the vessel was built by Messrs. Cook, Welton & Gemmell, and the machinery by Messrs. Amos & Smith, this making the thirtieth set of engines and boilers supplied and fitted by them in the "Red Cross" ships. During the trial the machinery gave every satisfaction. Mr. W. Beath, superintendent engineer, represented the owners.

Chatton.—On January 9th the new screw steamer *Chatton* built by Messrs. John Readhead & Sons, West Docks, South Shields, to the order of Messrs. Steel, Young & Co., London (of which we gave full particulars in our launch columns, January issue, page 427), was taken to sea on her official trial trip, and had a series of successful runs, averaging a speed of 11½ knots. The vessel was constructed under the supervision of Captain Picot, the company's marine superintendent, and Mr. Marshall, engineering superintendent, who were present at the trial trip.

Omrah.—On January 9th the twin screw steamer *Omrah*, built by the Fairfield Co. for the Orient Steam Navigation Co. (of which we gave full particulars in our launch columns, October issue, page 292), completed her steam trials on the Firth of Clyde. The series of tests to which the vessel was submitted were of the thorough description one associates with the name of the Orient Line. She went down the river from Princes Dock on January 5th, and had a brief turn in the Firth before coming to anchor at the Tail of the Bank. On the following day, when it was blowing hard from the south-west, she left at ten o'clock on a preliminary run, and in the afternoon commenced the contract trials with four runs between the Cloch Light and Cumbrae Head. According to the contract, she was to attain a speed of 16 knots with 8,500 I.H.P., but, notwithstanding the heavy weather, the result was 17¼ knots with 9,000 I.H.P. On January 7th the progressive runs over the measured mile at Skelmorlie were got through with as satisfactory results—two each at 14, 15, and 16 knots respectively. Afterwards she went on a six hours' run at 8,500 I.H.P., and maintained an average of 16½ knots with so much in reserve that the representatives of the owners were content with the test at the end of three hours. On January 9th the trial was more severe, the stipulation being that a speed of 16½ knots should be maintained with 8,700 I.H.P. on a continuous run of twelve hours. That the vessel could do this with ease was again demonstrated, for with her engines developing 9,200 I.H.P. the mean speed was 17·3 knots. The revolutions were 77·5 and the coal consumption just under 1·4 lb. per I.H.P. per hour. In the whole series the results have been of the most satisfactory description, and the results reflect very great credit on the engineering staff which Mr. Gracie controls.

Bullfinch.—On January 12th the torpedo boat destroyer *Bullfinch*, built by Earle's Shipbuilding Co., of Hull, ran the measured mile off Withernsea. There was a perfect sea, and the trial was most satisfactory. The requirements of the Admiralty were that the *Bullfinch* should attain a speed of 30 knots on the measured mile.

Ran.—On January 12th was witnessed the first trial trip of the year from the yard of Messrs. Wm. Gray & Co., Ltd. This was the trial of the s.s. *Ran*, which vessel has been built for Mr. Jacob R. Olsen, of Bergen, Norway, of which we gave full particulars in our launch columns, November issue, page 330. The trial was not a lengthy one, owing to the vessel being engaged upon a time charter, but it was in every way satisfactory, and was carried out in the presence of the owner, Mr. Jacob R. Olsen, and Capt. Murrell, of the Shipyard.

Romney.—On Friday, January 13th, the large steel-screw steamer *Romney*, built by Sir Raylton Dixon & Co., Ltd., Cleveland Dockyard, Middlesbrough, for Messrs. Lamport and Holt, of Liverpool, was taken out to sea for her official trials, under the command of Capt. Trenaman. Her principal dimensions are:—Length, 393 ft.; beam extreme, 50 ft. 3 in; depth moulded, 30 ft. 6 in. She is built to British Corporation highest class, and specially designed to meet the owners requirements for their large cattle and general trade between Liverpool and South America. The upper deck is fitted for cattle with shade deck over it of pitch pine, extending the whole length of vessel. She is also fitted with six watertight bulkheads, water ballast in cellular bottom and both peaks, with accommodation in houses on bridge deck for captain, officers, and engineers. Triple expansion engines have been fitted by Messrs. Thos. Richardson & Sons, Ltd., Hartlepool, having cylinders 27½ in., 44 in., 75 in., by 48 in. stroke, supplied with steam by three large single-ended boilers, fitted with Howden's forced draught, and working at 180 lbs. pressure. The ship and machinery have been constructed under the personal supervision of Mr. Russell and Mr. Thompson, the ship and engineering superintendents respectively.

Bergenhus.—On January 19th the large steel screw steamer *Bergenhus*, built by Messrs. Irvine's Shipbuilding and Dry Docks Company, Limited, West Hartlepool, of which we gave full particulars in our launch columns, January issue, page 429, was taken out to sea for her official trials under the command of Captain Svendsen. After the vessel's compasses were adjusted her head was turned seawards, when she made several runs averaging 11½ knots speed, and the greatest satisfaction was expressed with the performance of ship and machinery.

Pilot.—On January 19th the s.s. *Pilot*, built by Messrs. Ritchie, Graham & Milne, Whiteinch, ran her official trial trip at Skelmorlie, and was found in every way satisfactory. The dimensions of the vessel are:—Length, 118 ft.; breadth, 18 ft. 6 in.; and moulded depth, 7 ft. 6 in. She has a graceful appearance, being flush-decked, with large saloon forward and all the latest arrangements for the comfort of passengers. The vessel is intended for passenger traffic on Carlingford Lough, Ireland, to carry 550 passengers on 4 ft. draught, even keel, and is fitted with a pair of inverted C.S.C. engines of 170 H.P. The speed obtained was half a knot in excess of the contract. The machinery was supplied by Messrs. Campbell & Calderwood, Paisley, and worked very satisfactorily.

Eleanora Mail.—On January 20th the steel screw steamer *Eleanora Mail* left the shipbuilding yard of Messrs. Craig, Taylor & Co., Thornaby-on-Tees, for her trial trip, which proved highly satisfactory. The dimensions of the vessel are—278 ft. by 40 ft. 8 in. by 20 ft. 6 in. depth, moulded. She is of the single deck type, with poop, bridge, and forecastle, and has been built to the highest class in Lloyd's, with all the latest improvements for economical working. The engines, which have been constructed by Messrs. MacColl & Pollock, of the Wreath Quay Engine Works, Sunderland, are 21 in., 34 in., 56 in. by 39 in. stroke, with two boilers 13 ft. 6 in. by 10 ft., 160 lbs. pressure. During the whole of the trip the engines worked with the greatest smoothness, and on the run from the Tees to the Tyne, a speed of 11 knots was maintained. Mr. John. T. Mail, of the firm of Messrs. Mail Bros., Newcastle, the owners of the vessel, expressed himself as being highly pleased with both the ship and engines, as also did Mr. MacFarlane, of the firm of Messrs. Mail, MacFarlane & Co., Limited, the owners' consulting engineers. The vessel, under the command of Captain Anderson, proceeded to Tyne Dock, where she will load for Alexandria.

Diamante.—On January 20th this vessel, built to the order of the China and Manila Steamship Co., of Hong Kong, by Messrs. Hall, Russell & Co., of Aberdeen, was tried off the coast at Aberdeen with the greatest success. The steamer is fitted out as a passenger and cargo steamer of the usual type so popular in the East, the highest class at Lloyd's, and with Board of Trade certificate. The dimensions are 260 ft. by 36 ft. 6 in. by 24 ft., with 'tween decks fore and aft, 7 ft. high. The engines are 22 in., 35 in. and 58 in., stroke 39 in. The propeller blades are of manganese bronze. The boilers are of full size and fitted with Howden's forced draught, and during the four hours' trial at full speed gave more than ample steam. The I.H.P. was 1,534. Heating surface 3,600 square ft.; speed 15½ knots per hour. The vessel is fitted with electric light by Messrs. Claud Hamilton & Co., of Glasgow. Feed pumps and heater by Messrs. Weir; circulating pump and engine by Messrs. Drysdale; oil filter by Messrs. Kirkaldy; steam-steering gear by Messrs. Davis & Co., Limited, of London. Steam winches and windlass by Clarke, Chapman & Co., of Gateshead. The donkey boiler is of an improved type by the builders. The representative of the owners, Messrs. A. & W. Dudgeon, of 63, Leadenhall Street, London, E.C., expressed their greatest satisfaction with the ship and the results attained.

Hermes.—On January 21st the s.s. *Hermes* built by Messrs. John Blumer & Co., North Dock, Sunderland, to the order of Messrs. R. P. Houston & Co., Liverpool, had a most successful trial trip. The vessel ran several times over the measured mile, attaining a speed of 14·8 knots, the engines working in a most satisfactory manner throughout, and indicating 3,000 H.P. The engines are by Messrs. John Dickinson & Sons, Limited, Sunderland, having cylinders 26 in., 43½ in., and 72½ in. by 48 in. stroke. There are three extra large steel boilers of 180 lbs. pressure and special attention has been paid to the auxiliary machinery in the engine-room, which is of the latest and most improved type. The dimensions of the vessel are 365 ft. by 47 ft. by 27 ft. 6 in. to spar deck, with a shelter deck, and she is built to Lloyd's highest class. The senior of Messrs. Houston's firm, Mr. R. P. Houston, M.P., being himself a practical engineer, and having also a most intimate knowledge of all the various requirements of the River Plate trade, derived from his long connection therewith and extensive personal experience, he has specially designed the vessel and all her arrangements for his Plate Line of steamers. Cattle stalls of the most modern type, have been fitted for over 500 head of cattle in the 'tween decks, and a large number of sheep are provided for on the shelter deck. A thorough system of ventilation has been arranged throughout the ship and a most efficient water service fitted, and everything possible provided in order that the live stock may be landed at Liverpool in the best possible condition. The arrangements for the rapid loading and discharging of the general cargo are of the best description, the vessel having been fitted with specially powerful winches, supplied by Messrs. John Lynn & Co., Limited, Sunderland. The cargo gear is also exceptionally strong, and very heavy weights can be lifted with ease. A large saloon house is placed amidships for the accommodation of the captain and a few passengers. The saloon is handsomely panelled in oak and richly upholstered. The passengers' rooms are also of the most comfortable description. The officers have ample and splendidly fitted accommodation in large deck houses amidships, the crew and cattlemen having roomy and comfortable quarters in the forecastle and poop respectively. The trial passed off very pleasantly, and the usual toasts were proposed and responded to. Among the company were R. P. Houston, Esq., M.P., Messrs. William Blumer, F. T. Dickinson, George Swainston, junr., A. Swainston, Wm. MacLaren, H. J. Stanton Ferry, J. A. Bowden, and J. W. Wiles. The hull and engines during construction have been superintended by Mr. Wm. MacLaren, of Liverpool, assisted by Mr. H. J. Stanton Ferry and Mr. Adamson, chief engineer. The cargo and cattle arrangements have been superintended by Captain Hopkins, assisted by Captain Davies, who takes command of the vessel.

Ashmore.—Lately, the new steamer *Ashmore*, which has been constructed by Messrs. William Dobson & Co., Low Walker-on-Tyne, to the order of the Adam Steamship Co., of Aberdeen (of which we gave full particulars in our launch columns, December issue, page 369), went out to sea for her official trial trip, which passed off in a very satisfactory manner, a speed of over 13½ knots per hour being attained. The owners were represented at the trial by Mr. J. Stewart, who has superintended the construction of the hull and engines.

Reviews.

Gleanings from the Patent Law of All Nations. By W. Lloyd Wise. London: Cassell & Co. 1896.

In our issue of May, 1896, we reviewed the first part of the first edition of this book. We have how received a copy of the first volume of the second edition. As we stated at the time, we considered the book, so far as we could then see, one which would be likely to be very useful to inventors and others who are interested in international patents. That belief we still hold, and it is strengthened by the fact that the book is now in a second edition. But we can add very little to this. For we have not had the opportunity of seeing anything but the first volume of either edition, and it does not appear that any new matter has been introduced since the first publication.

Electrical Engineering. By W. Slingo & A. Brooker. London Longmans, Green & Co. 1898.

The history of this substantial volume is its best claim to the attention of our readers. Originally published in March, 1890, it was reprinted a couple of months later. Three more reprints were demanded and supplied within the next thirteen months. In January, 1895, and again now, new and revised editions have been afforded to the public. The reason is not far to seek. There was a much felt want of a book which should cover the whole field of electric lighting from the point of view of artisans and students of electricity. The authors, who were well aware of the wants of students in general, and particularly of those who frequent the City and Guilds of London Institute, endeavoured to supply a volume which should fulfil the requirements not only of students, but of all those who, without much electrical education, have to manage various kinds of electrical machinery. The book therefore deals with something more than mere electric lighting. It instructs and advises all those who have to deal with any of the various installations by which electrical power is devoted to commercial purposes. The tas has been carried out with a constant regard to the attainments of those for whom it is written, and high mathematics are avoided, whilst the simplest language possible is used. Opportunity has been taken of the new editions to bring the information afforded down to the latest practice of the day, and the book may now safely be recommended as a thoroughly practical, and, as far as those for whom it is written are concerned, exhaustive work.

Marine Boilers. English Edition of Mons. L. E. Bertin's work. Translated and edited by Leslie S. Robertson, A.M.I.C.E., M.I.Mech.E., M.I.N.A. London: John Murray.

A book which should be of interest to all marine engineers, has just been published in this country. It is an English edition of M. Bertin's work on "Marine Boilers." As most of our readers are no doubt aware, M. Bertin holds the exalted position of Chief Constructor to the French Navy, and therefore has an authority in dealing with such a subject as marine boilers, and the recent developments that have taken place in them, which it would be difficult to overrate.

Sir William White, K.C.B., writes a short preface to introduce to English readers the English version of a standard French work. He says: "it is a pleasant task, since the book is certain to receive a welcome from all who are interested in the production of steam power. M. Bertin is the responsible designer of the latest and swiftest cruisers now building in France, consequently no one is better placed for speaking authoritatively and with complete information respecting the most recent French practice in marine engineering and boiler construction. Perhaps the chief interest of this work will be found in sections dealing with tubulous boilers. In the use of such boilers for marine purposes, French engineers have shown a remarkable courage and enterprise, in fact, the tubulous boiler now reigns supreme from the torpedo boats up to the largest cruisers and battleships. M. Bertin deals with the subject frankly and exhaustively; he traces the history of each type of boiler, enumerates its advantages and its disadvantages, and indicates the line of future progress. All English naval architects and marine engineers are happy to acknowledge the lead which their French colleagues have taken in this matter, and the benefit which they have obtained from French experiment and experience with tubulous boilers. This book presents the best summary yet available

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from a French source, and what that experience has been. It is hardly necessary to add that in its arrangement, style, and terseness, the book is a worthy specimen of French method. In its English dress, much information has been added to the latest French practice."

Of subject matter contained in the book there is no paucity. Almost everything touching marine boilers and cognate subjects is touched upon. The book opens with a chapter on the laws underlying steam navigation, and although this might, strictly speaking, be considered a subject coming more particularly within the province of the naval architect, yet the spheres of the naval architect and the marine engineer are so closely allied, that every competent marine engineer must now-a-days have a thorough knowledge, not only of marine engineering, but of naval architecture, electric lighting, and other cognate subjects.

The subject of the radius of action of a vessel and her coal consumption is of such cardinal importance that no apology need be made for dealing with it in a book of this kind. The experience of the late Spanish-American War brought this fact into prominence, and the French have given for some time an importance to the question of coal consumption and radius of action which it has not met with in this country. The true importance of the question is, however, coming slowly but surely to the front in our own Navy.

Having touched on these points, M. Bertin proceeds to give a short epitome, in the second chapter, of the various types of boilers met with afloat, from the old box boiler up to the latest types of tubulous boilers.

The subject of marine engines has been dismissed in the English edition in a very few words, as the ground is so fully covered by existing standard text-books.

The production of heat from coal occupies a portion of chapter four, and some interesting tables of calorific values are given. The tests insisted upon for the reception of coal in the French arsensals will also be read with interest. Natural draught and forced draught occupy a large portion of this chapter, and the resistances to the passage of gases in the different parts of boilers and their relative value is dealt with.

M. Bertin traces the use of forced draught from its earliest stages through the various developments that have occurred in the French and other navies, giving the results attained by the various systems in use, such as air jets in the funnel and ash-pan, closed stoke-hold, closed ash-pan, induced draught with fans in the funnel, the different systems of heating the air prior to its introduction into the furnace, together with the most recent results as to coal consumption on the various systems. Such practical questions as firing, tube-cleaning, priming, disappearance of water level, methods of stoking on consumption trials, length of trial trips, and mechanical stoking are all dealt with in this chapter.

No modern book on boilers would be complete without a reference to the important subject of liquid fuel, although in the British Navy is it very doubtful whether there will be and can be, at least for the present, any considerable development in this direction, yet our readers are no doubt aware that the British Admiralty are at present experimenting on the Normand boilers of the torpedo-boat destroyer *Surly* as to the efficiency of liquid fuel. M. Bertin gives a *resume* of the French and Russian experience on this subject, enumerating the various kinds of atomisers and furnaces that have been tried, together with the water evaporated, and also a comparison of the efficiency of coal and liquid fuel.

Chapter six is consecrated to the production of heat, quantity of air for complete combustion, smoke, and its analysis, together with the transmission of heat to the water. M. Bertin makes a remark which we cannot help emphasizing. He says, "the extent of heating surface does not indicate the amount of water the boiler is capable of evaporating, nor does the grate area show the amount of coal it can burn." The rough and ready but unscientific method of comparing boilers of different types merely on their respective amounts of heating surface or grate area are to be deprecated, and some more satisfactory standard of comparison of the duty and efficiency of the various boiler types should be adopted.

The subject of lagging and the various tests carried out by M. Brocard will be of interest as shewing the widely different efficiency of the various classes in lagging; but this is a subject which we intend to refer to at a future date.

The pitting and wear due to chemical action is dealt with by M. Bertin, in chapter seven, where several practical hints are given as to the best methods of preventing pitting and similar evils. The methods adopted for preserving the boilers abroad, by such people as Belleville, the Messageries Maritimes, and others, are also referred to.

Part II. is given up to tubular boilers; single-ended and double-ended cylindrical boilers, Admiralty type boilers, and locomotive boilers. Drawings on a small scale are given of some of the various classes of boilers. M. Bertin does not pretend to go very deeply into the actual constructive details of these various boilers, but deals with the subject in a more general way, it being borne in mind that the book is the outcome of his lectures to the engineering students at the training college for the French Navy. The important question of the construction and strength of furnaces, furnace crowns and stayed walls, are dealt with in a straightforward way, and a good deal of interesting and valuable information is gleaned from the various accidents that have occurred from time to time, and the cause or causes giving rise to them. The table of weights, coal consumption, horse-power, &c., &c., from a large number of French boats is given, and the mass of information contained in Table II. and the corresponding table for tubulous boilers, though not, perhaps, apparent at first sight, will well repay careful study. M. Bertin not only gives the actual finished weights of the boilers, but also of the fittings dependent upon the boilers, and designers who are roughing out weights and sizes of boilers, will find this table of considerable service, as it contains not only fighting ships, from torpedo-boats to large cruisers, but also examples of non-combatant vessels.

After all the real interest of the whole book centres round Part III., which is devoted to tubulous boilers. Here M. Bertin has placed before the reader a consecutive history of the introduction and adoption of the tubulous boiler, and one is struck on looking through the many illustrations contained in this part with the strong likeness between the various types of boilers.

The subject is divided according to the circulation in the various boilers. He classes them all under three heads, boilers with limited circulation, free circulation, and accelerated circulation. The first boiler to be dealt with is naturally the Belleville, and M. Bertin traces its history right up from the very earliest stages of the first boiler, which was tried on the Biche in the year 1856. The gradual developments, which are clearly shown in the various illustrations through the various types, 1866, 1869, 1872, 1894, up to the present day, form in themselves a most instructive series of illustrations. M. Bertin gives the best and most recent French practice, and we find on comparison with the French edition that the translator has added the results obtained in our own *Diadem*.

Chapter 12 deals with the boilers with free circulation, and opens with the work of a man well known in France, but whose work is not so often heard of in this country, viz., M. Joessel. The Penelle, Oriolle, d'Allest, Seaton, Babcock & Willcox, Anderson & Lyall, Towne, Petit & Godard, Leblonde & Caville, Field, Collet, Niclausse, Dürr, Ward, and other boilers are dealt with in this chapter. M. Bertin is to be congratulated that he has not been afraid of showing up the accidents and difficulties that have been met with in the introduction of various classes of tubulous boilers. Often more progress is to be gained by knowing what to avoid, and what mistakes have been made by others, than writers on technical subjects seem to be aware of, and M. Bertin, who is not himself a patentee, but a high government official, has dealt with the subject in a fearless but at the same time in a perfectly straightforward and unbiassed manner.

Boilers of accelerated circulation occupy chapter 13, which opens with some remarks on the theory of circulation, and some interesting formulæ on this much-debated question. Anyone who has followed the discussions in the technical journals and scientific societies must have been struck with the widely differing opinions held by our ablest engineers on this subject. M Bertin gives the honour of the first introduction on a practical scale of boilers with accelerated circulation for marine propulsion to Captain du Temple. M. Sochet anticipated M. du Temple, but his boiler was not put to any practical and useful purpose for navigation, although the experiments he made were very instructive. The work done by M. du Temple, whose boiler was originally intended for aerial navigation, is very interesting. It is, however, largely due to M. Normand, who introduced several practical and useful modifications into the earlier form of du Temple boiler that much of the success of the du Temple boiler is due. M. Bertin gives illustrations of the du Temple Normand boiler with the results obtained on trials. M.

Guyot again modified the original du Temple boiler and several du Temple Guyot boilers were fitted in torpedo boats in 1896.

The work done by M. Normand, and the results obtained by him, will be read with interest. For instance, the actual figures, weights, &c., of the *Forban*, a boat which was for some time the fastest boat afloat, and which combined a speed of 31 knots with a comparatively small displacement are given, and are of considerable interest. It appears that while steaming at 31·03 knots, a rate of combustion of 63·9 lbs. of coal per square foot of grate was maintained, and 46·8 H.P. per square foot of grate developed. The Normand-Sigaudy boiler is also of interest, in view of the fact that it has been adopted on the *Chateau Renault*, a boat of 22,500 H.P., illustrating a departure from the use of the large tube Belleville boilers for installations of this size in favour of small tube boilers. The figures for the *Jeanne d'Arc*, a cruiser of 28,130 H.P., fitted with the Du Temple-Guyot, are also given. These boilers are likewise of the small tube type. The Leblond and Caville, and d'Allest are both given as recent types of boilers with accelerated circulation, but do not call for any special remark. The next boiler which is of special interest to ourselves is the Thornycroft boiler. M. Bertin gives the experience with this boiler in the French Navy, where several of the Thornycroft boilers are at work. The later types are also given, though not, we believe, quite the latest type of all. The results obtained with this boiler on Destroyers are given, and show an I.H.P. of 29·8 per square foot of grate on the full speed trials, with the consumption in the one case of 2·08 and in another of 2·2 lbs. per I.H.P. per hour. The *Desperate* at 30 knots, indicating 5,800 H.P., consumed 2·48 lbs. The Mosher boiler, which was fitted on the *Maine*, resembles strongly the Thornycroft boiler turned inside out. This boiler and the Symon House boiler, both deliver above the water level similarly to the Thornycroft boiler. The well-known Yarrow boiler is the next one dealt with. The weights of the *Hornet's* boilers are given, but no figures as to power or consumption, which we think is a pity. The other types of boilers, such as the Blechynden, Reed, White, Fleming & Fergusson, Seaton, and many others are described and illustrated. M. Bertin, in chapter 14, deals very clearly with the special advantages of tubulous boilers for marine purposes. On the question of weight he gives a short table of the total weight per square foot of grate of the various classes of boiler, ranging from cylindrical boilers of the Admiralty type, weighing 1,224 tons per square foot of grate, to the Thornycroft boilers, with 356 tons per sq. ft. of grate. The ability of tubulous boilers to stand forcing, the rapidity in getting up steam, durability, space occupied, facility for repairs, ability to stand sudden changes of temperature, and last, but not least, the variou sprices of the different types of boilers, are dealt with. The section of the book dealing with tubulous boilers closes with a table similar to the one we have already called attention to for cylindrical boilers, and nowhere, as far as we are aware, has there been published in any book the actual finished weights of not only the boilers, but of the accessories, such as feed pumps, feed pipes, distillers, spare gear, etc., etc., and the labour which the conversion of the French figures into our English measures entailed upon the translator, must have been very considerable.

The two concluding chapters of the book are occupied with boiler-mountings and accessories, and except for the question of areas of safety valves, for which most elaborate and complicated formulæ are given, the subject matter is naturally of somewhat rudimentary kind. Various classes of feed-regulating gear are, however, given. This is an important subject, for tubulous boilers contain only a small proportion of water. Those enumerated are the Belleville, Thornycroft, Sigaudy, Normand, Messier, and Yarrow automatic feed-regulators. Filters are represented by M. Normand's sponge-filter, which has been, till lately, universally used in the French Navy. No doubt in the next edition of M. Bertin's valuable work we shall have the pressure-filters dealt with also.

Feed-heaters are described and the calculations showing the saving effected by their use will be read with interest. M. Bertin gives the "final result of the net saving as 13 per cent." This, of course, is under the conditions assumed in the calculations.

The index seems to be fairly full, and should form a very valuable adjunct to the book. For instance, under the heading of tubulous boilers no less than 53 various types of boiler are enumerated. The book seems admirably adapted for the class for which it was written — namely, for the future engineers of the French Navy; and, although the author gone very deeply into some of the more practical questi actual construction, he has dealt with the subject in a comp sive way, and in a manner which should give the engin student, and, we may venture to add, many a hard-w practical engineer, a valuable survey and history of tu boilers which he will not find in any other existing text The book is profusely illustrated and well bound.

The Model Engineer and Amateur Electrician. Edited by P Marshall, A.I.Mech.E. London: Dawbarn & Ward.

This is the first volume of a monthly journal of "Mec and Electricity for Amateurs and Students." Its obje reach and to cater for those who take up practical mec and kindred subjects as a hobby. A hobby in such purs certainly a matter for the amateur, and the student is simp who organises his hobby and means to make it some day o keep him instead of being a continual expense to him. question of expense is the stumbling block to most ama unless they are very well-to-do or singularly well-advise they go to books, or still worse, to the catalogues of dea such appliances, as they need advice, they are told that comprehensive and expensive installation will be requisite practical friend of such as are fortunate to have one is advise that such and such a thing will not be required at and that a very good substitute for this other very exp appliance can be worked up for a very few pence. The the little volume before us is to be the friend of the amateu to be a more comprehensive friend than any individual co For the "tips" which it offers are derived from many and cover many fields of enterprise. Inquiries on many su are invited and skilfully answered. Many suggestions amateur are thrown out, and the publication will undoubte useful to all who are themselves ready with their hands and to develop and apply that readiness with intelligence and least possible cost.

Recent applications for Patents connected Marine Engineering, Ship Construction Mechanical Appliances for use in Ships, December 2nd, 1898, to January 10th, 1

24880 W. R. Lawson. Ships' rudders.
24892 T. White. Locking indicating deck-plate.
24896 G. N. Philip. Water-tube boilers.
24899 R. de Columbier. Automatic life-saving raft.
24907 F. G. Sennett & W. G. Williams. Ships.
24913 J. T. Norris. Connecting-rods.
24948 A. T. Dawson, T. Thackeray, & J. Horn. Ammu hoists for ships.
24960 T. H. & E. Mitchell. Engine bearings.
24967 J. G. A. Kitchen. Pistons.
24991 R. Wesch. Ships.
24993 C. Lockwood. Pistons.
25001 W. Mullan. Side scuttles for ships.
25006 J. B. Lafond. Internal combustion engines.
25008 A. E. Broquet. Preventing ships from sinking.
25012 B. Gee & R. Webster. Steam engines.
25042 E. Gruby. Compass card.
25057 A. Robertson & J. Rowan. Eccentric swivelling for ships.
25059 J. O'Kelly, M.P. Torpedo gun.
25060 M. D. Cvetkovich, G. Kukac, C. Mingotti, & A. S Drag for vessels.
25088 T. F. & T. S. Walker. Ship log apparatus.
25092 S. A. E. Hickson. Rotary pressure engine.
25095 G. G. M. Hardingham (the firm of Felton & Guille Germany). Conductor for submarine cables.
25138 J. G. A. Kitchen. Metallic packings.
25185 W. T. Elliott. Clappers for bell buoys.
25228 E. Bacon & G. Jackson. Slipper for fishing-gear b
25241 T. Downie. Winches.
25242 J. Davidson & T. R. Hampson. Engine governors.
25243 J. Davidson & T. R. Hampson. Engine governors.
25254 D. J. Morgan. Lifeboats.
25311 G. C. y Elias. Torpedo boat or ejector.

25341 A. Shaw & A. Bland. Metallic packing for piston-rods.
25358 G. F. and F. W. Stevens. Contrivance for trawl nets.
25361 J. O. Dolman. Shade for ships' telegraph.
25384 T. Whitaker. Steam derrick cranes.
25408 J. M. McLean and A. Sykes. High-speed engines.
25421 W. R. Lawson. Ships' derricks.
25436 F. R. Patey. Boat-lowering appliances.
25448 J. Watt and W. A. Davies. Metallic packing.
25451 J. Kay. Ballasting tanks for vessels.
25472 W., J., and E. Rockhill. Tubular boiler.
25473 C. H. Prichard. Submarine sound transmitter.
25496 Stothert & Pitt, Limited, and W. Baxter. Friction gear.
25529 A. Phillips. Side scuttles for steamers, &c.
25583 J. McLean and F. C. Elliott. Marking gauge.
25603 D. McNeill. Steamer position indicator.
25604 A. MacLaine. Protecting propeller shafts.
25635 T. F. and T. S. Walker. Ships' log apparatus.
25673 E. S. Beck. Propellers.
25677 V. Ranalli. Propelling ships.
25702 J. B. Houston. Forced draught for furnaces.
25713 G. Cardosa. Propellers for ships.
25716 E. E. Wigzell. High-speed engines.
25723 J. A. Miller. Steam generators.
25736 O. Imray. (W. C. Temple, United States.) Boilers.
25737 B. Tower. Steadying guns on shipboard.
25744 J. and J. L. Bliss. Ships' logs.
25761 A. Berrenberg. Vacuum pumps.
25762 A. Berrenberg. Doubling-acting vacuum pump.
25787 T. Parkinson. Light-feed lubricator.
25790 E. T. Ferrier. Metallic packing.
25825 M. Gray. Stop fishing reel or winch.
25826 W. T. Lord. Boats' rowlocks.
25828 A. H. Lacock. Reversing propeller for steamships.
25835 F. S. Thorn and C. Hoddle. Float valves.
25848 E. Oldenburg. Submerging submarine boats.
25858 J. S., T. A., and E. R. Walker. Valves.
25859 A. T. Rouse. Floating sea anchors.
25910 P. M. Baxter and W. Scott. Capstan.
25926 T. Sugden. Purifiers for steam generators.
25933 J. S. Terrell. Paddle-wheels for vessels.
25942 C. Johnson & W. Griffin. Ships' berths.
25977 H. Blessingen. Water-tube boilers.
25980 J. Damlos. Valve gear for steam engines.
25988 J. Gwynne & E. W. Sargeant. Pumps.
26001 R. W. Lewis. Bracket for trawl otter boards.
26003 T. Wallace. Laying planks on ships' decks.
26039 J. S. & J. L. White & A. Forster. Water-tube boilers.
26046 W. H. Bond. Rotary engines.
26053 G. H. Jones. Water gauges.
26112 J. W. Wailes. Rivets.
26124 J. Judge. Steam generator.
26150 W. Critchlow. Clearing deposits from the mouths of harbours.
26166 A. E. Sorby. Brake apparatus for ships.
26179 J. E. Slack. Ring joints for flanges.
26189 E. A. Charters. Automatic steam injector pumps.
26198 H. R. Walker. Locking devices for nuts.
26199 W. B. Thompson. Surface condensers.
26206 H. Austin. Vaporising oil for oil engines.
26213 G. Davis. Boat.
26227 W. White. Propelling boats and vessels.
26240 R. A. Lowe & H. Line. Metallic pipes.
26244 J. Brotan. Steam generators.
26277 P. Buckley, O. Holmes & H. Hemingway. Slide valve releaser.
26288 J. F. Pool. Mechanical stokers for furnaces.
26290 J. Hodkinson. Stop valves.
26305 G. Gay. Marine propellers.
26306 W. T. Parrott. Attachments to buoy lamps.
26316 R. Thompson, S. J. Glover & J. Porter. Ships' ventilators.
26355 G. S. A. Ranking. Boat-lowering devices.
26371 N. Tesla. Controlling mechanism of vessels.
26395 C. E. Ferreira. Feed-water heaters.
26423 W. Shinn. Governor for steam engines.
26424 A. E. Jenks. Wrought iron flanges.
26428 F. E. Walker. Joint for steam-pipes.
26433 F. T. Cooper. Opening water-tight doors.
26446 E. A. Storer. Driving gear for boats.
26447 G. W. de Tunzelmann. Preserving propelling shafts from water cutting.
26467 W. P. Thompson (F. G. Nielsen, Germany). Fender for protection against collisions at sea.
26472 J. Hentschel. Fire-boxes for steam boilers.
26486 M. Ribitschek & L. R. von Herz. Cooling the stokeholds of ships.
26491 J. Butterworth. Metallic packings for piston-rods.
26511 W. Walker, jun. Ships' hatch cleat.
26549 T. W. Scott. Steam engines.
26579 H. B. Barlow (J. Campbell, Ceylon). Self-closing water valve.
26596 M. H. C. Shann. Internal combustion engines.
26597 F. Tyers. Furnaces for heating rivets.
26623 W. B. Brown. Draught ropes of steam trawlers.
26626 T. Thompson. Steam boilers.
26658 W. Simpson, W. L. Bodman, D. H. Simpson. Instantaneous steam generators.
26678 J. B. Thompson & J. Smith. Friction clutches.
26686 J. Thomson. Hoisting and lowering boats.
26699 J. Murrie. Indicating the level of water.
26702 F. W. Lanchester. Screw propellers.
26706 J. Boens. Cable lightning conductor.
26721 P. Bailly. Engines.
26773 L. de Somzee. Avoiding collisions at sea.
26774 W. C. Lockwood. Packing for piston-rods.
26776 A. W. & L. W. Case. Rotary pumps.
26792 A. Stenhouse & E. A. Whitehead. Automatically operating a valve.
26801 C. B. Bender. Obturation for pistons.
26806 W. B. Thompson. Steering gear for ships.
26813 J. Macnarey, W. H. Smith & H. W. Dearden. Anti-friction metal covering.
26817 E. F. Gwynn. Mechanism for cleaning boiler tubes.
26848 W. R. Green. Propellers.
26887 H. P. Arbecam. Indicator for ships' compasses.
26896 F. G. Moon. Boat.
26904 V. Purrey. Steam generators.
26919 R. Haddan (J. E. Whiting, India). Self-acting sluices.
26927 C. Hibberd & J. Barton. Lifeboats.
26984 J. E. Spagnoletti, J. Grookes & J. Lawrence, Light indicator for electric lights on ships.
27027 J. Price. Dredging.
27029 A. B. Brown. Steering machinery.
27036 E. R. Richardson & R. Turnbull. Safety arrangement for engine governors.
27041 W. J. Crossley and J. Atkinson. Internal combustion engines.
27043 W. J. Crossley & J. Atkinson. Reducing the noise of the exhaust of internal combustion engines.
27048 F. Cochrane. Fender for ships' boats.
27056 D. R. Thengdi. Steam turbines.
27070 W. A. Martin & G. Shaw. Steering gear.
27072 F. W. Golby (J. Schütte, Germany). Steam boilers.
27079 A. E. Preston. Moveable keels for boats.
27086 W. K. Dickson. Vacuum pumps.
27096 J. Pearce. Thrust blocks.
27098 H. Lindley and Browett, Lindley & Co., Limited. Engine governors.
27102 H. Craighead. Steam boiler furnaces.
27128 L. & C. J. Varicas. Steering apparatus.
27129 H. Norris. Machine for corrugating tubes.
27135 J. Adair. Controlling the speed of engines.
27139 H. J. Waterworth. Compound steam engines.
27164 G. Hanf. Water gauge.
27179 J. R. Hughes and C. W. Austin. Steam engines.
27203 J. Stumpf. Valves for steam engines.
27212 R. Shapland. Propulsion of ships' boats.
27213 R. Shapland. Propulsion of ships' boats.
27225 J. J. Tinker. & W. P. J. Fawcus. Steam generators.
27243 J. C. R. Oakes. Water-tube boilers.
27281 G. Fraser. Navigable vessels.
27282 B. Rose. Metallic screw nuts.
27285 W. Ansell. Mast-head sheaves and frames.
27288 F. Anderheggan. Utilising the energy of steam.
27297 R. H. Martin. Non-conducting covering.
27301 E. Wilson. Torpedoes.
27331 W. P. Thompson (J. A. Stevens. United States) Boilers.
27420 Babcock & Wilcox, Limited, and G. W. Thode. Mechanical chain grate stokers.

27438 C. Groll. Water-tube steamer generators.
27456 S. S. Younghusband. Slide valves for engines.
27481 G. Longworth. Steam boiler furnaces.
27484 F. Lobnitz. Dredging machinery.
27485 F. Lobnitz. Pumps.
27491 J. A. Purves. Lighthouse apparatus.
27494 W. Gordon. Regenerative water furnaces for boilers.
27495 W. Gordon. Regenerative bridge for boilers.
27496 W. Gordon. Regenerative furnaces for boilers.
27505 A. Pfister. Purifying boiler feed-water.
27535 R. A. Steen. Packing piston-rods.
27536 E. W. Bell. Coverings for boilers.
27540 J. W. Johnson. Steam rotary engines.
27550 F. Lobnitz. Dredgers.
27553 J. R. E. Pattison. Firing guns at sea.
27555 T. Gare. Varying the length of connecting roads.
27604 J. T. Kellett. Internal combustion engine.
27623 B. J. P. Roberts Controlling speed of engines.
27624 B. J. P. Roberts. Governor for steam engines.
27629 H. H. Lake (T. J. Kieley & F. T. Mueller, United States). Pressure-reducing valves.
27630 H. H. Lake (T. J. Kieley & F. T. Mueller, United States). Controlling pumps.
27631 H. H. Lake (T. J. Kieley & F. W. Mueller, United States). Steam traps.
11 C. E. Bradbury & R. Rostron. Steam traps.
41 W. Phillips. Controlling gear of steam-steering engines.
44 W. H. Harfield. Electrically controlling engines.
47 W. J. Reynolds & F. W. Gibbons. Ships' compasses.
50 C. Schlagbaner. Utilising power of the waves.
72 R. H. W. Thirkell. Gauge-glass fitting for boilers.
135 L. Davies. Securing propellor blades to their bosses.
147 R. Rickie. Direct-acting steam pump.
182 J. D. Castle. Compasses.
290 J. Carnegie, H. L. Ebsen, and W. J. Kennedy. Boilers.
323 J. L. Boothman. Steering machinery.
376 E. L. Martin. Connecting rudderheads to rudders.
397 J. C. Tinker. Boilers.
404 G. W. Laughton. Feed-water purifier, &c.
419 M. Hansen. Ships' davits.
445 C. Schumacher. Hydraulic machine tools.
466 J. G. A. Kitchen. Internal combustion engines.
529 T. Hughes & W. E. Millett. Engine valves.
530 A. H. Crockford. Multiple-expansion engines.

BOARD OF TRADE EXAMINATIONS.

EXTRA FIRST CLASS.

January 21st, 1899.	Burke, Michael J. ..	Ex. 1C	Liverpool
,, ,, ,,	Jensen, Vilhelm A...	Ex. 1C	London
,, ,, ,,	Lewis, Walter, T. ..	Ex. 1C	,,
,, ,, ,,	Niblock, Frederick ..	Ex. 1C	Liverpool
,, ,, ,,	Wilkie, James B. ..	Ex. 1C	,,

NOTE.—1C denotes First Class; 2C Second Class.

December 24th, 1898.

Aldridge, E.S...	2C	W.H'pool
Anderson, G. S.	2C	Glasgow
Bainbridge, W.	2C	W.H'pool
Balfour, W.J.D.	1C	Liverpool
Barrowman, W.	2C	Glasgow
Bonsor, H. N...	2C	London
Booth, Wm. C.	2C	Dundee
Borland, John..	2C	Glasgow
Bridger, W. G.	1C	London
Chester, A. E...	2C	N.Shields
Colwill, Tom H.	2C	Cardiff
Coundouris, G.	1C	London
Crawford, Peter	2C	Glasgow
Davies, Percy D.	2C	N.Shields
Ellerington, T.	2C	W.H'pool
Ellis, John W...	2C	,,
Firth, Wm. J...	2C	,,
Griffiths, G. H.	1C	Cardiff
Grimsby, C. E.	2C	Bristol
Hawes, Wm. ..	1C	W.H'pool
Kay, John D...	2C	Glasgow
illey, John B.	2C	W.H'pool
Lillico, Wm. ..	1C	W.H'pool
Macpherson, J.	2C	N.Shields
Maloney, John..	1C	Cardiff
Martin, Wm. D.	1C	Glasgow
M'Dougal, John	2C	London
Mildoon, H. ..	1C	Liverpool
M'Nair, James..	1C	Glasgow
Mylchreest, R...	2C	London
Neilson, Wm.M.	1C	Glasgow
Oswald, James..	1C	N.Shields
Page, James H.	1C	Liverpool
Page, John	2C	Dundee
Ramsey, J.C. ..	1C	Glasgow
Raven, Wm. H.	1C	Cardiff
Roberts, D. ..	1C	Liverpool
Ross, Arthur ..	1C	N.Shields
Rule, Davey E.	2C	Cardiff
Savaides, R. ..	2C	N.Shields
Shepherd, R. ..	2C	Glasgow
Small, John....	2C	Dundee
Smith, S. H. ..	1C	London
Thomas, E. J.G.	2C	Cardiff
Thornton, Thos.	2C	N.Shields
Tillett, T. M'G..	2C	Cardiff
Tyson, David ..	1C	W.H'pool
Urry, A. J.	1C	London
Watson, Chas...	1C	W.H'pool
Watson, J. H...	1C	Liverpool
Wigley, W. J...	2C	London
Wilson, G. W...	1C	Cardiff
Williams, H. A.	1C	,,
Young, J. Y. ..	1C	Dundee

December 31st, 1898.

Alexander, G. F.	2C	N.Shields
Allison, Henry..	1C	Sunderl'd
Angel, R. W. ..	1C	London
Bates, Edward..	2C	N.Shields
Blaney, Jno. ..	2C	L'nderry
Brankston, A...	1C	N.Shields
Cook, Jno. G. ..	1C	Sunderl'd
Cooper, David..	2C	Aberdeen
Coulson, T.A...	1C	Hull
Dawkins, J. D.	2C	N.Shields
Deane, W. Ross	1C	Aberdeen
Douglas, A. R.	2C	,,
Dowman, Harry	2C	,,
Fisher, M. H. ..	1C	Hull
Glentworth, H.	1C	London
Gordon, J. M. ..	2C	Aberdeen
Herrera, A.....	2C	Liverpool
Holmes, R. A...	1C	Hull
Houldin, H. R.	2C	Liverpool
Hutton, Robert	2C	Aberdeen
Judson, J. M...	2C	Sunderl'd
Keith, George..	2C	Aberdeen
Kelly, J. R.....	1C	London
Kennedy, J. W.	1C	Sunderl'd
Maclachlan, A.	2C	London
Miller, J. A. ..	2C	N.Shields
M'Kay, Adam..	1C	Aberdeen
Morley, Robert	2C	N.Shields
Nichol, Thomas	1C	,,
Paterson, A. H.	2C	Aberdeen
Peters, Thos. O.	1C	N.Shields
Pollock, Jno. S.	1C	London
Potts, Jno. W...	1C	Sunderl'd
Pride, Walter E.	1C	Liverpool
Raine, Wm. C.	1C	Sunderl'd
Roid, James ..	1C	Aberdeen
Scott, Henry ..	2C	L'nderry
Sealy, J. H. R.	2C	N.Shields
Sheridan, Wm.	2C	London
Simpson, J. A.	2C	Sunderl'd
Slack, Jno. C. ..	1C	London
Summerside, J.	2C	N.Shields
Twiss, Thomas	1C	Liverpool
White, Geo. F.	2C	N.Shields

January 7th, 1899.

Angus, Alexr. ..	2C	Glasgow
Beckar, Joseph	1C	,,
Bentley, Frank	2C	Liverpool
Buchan, Charles	1C	Glasgow
Dunn, Frederick	1C	Liverpool
Evans, Albert L.	2C	Cardiff
Ferguson, John	2C	Glasgow
Ferguson, R. H.	1C	,,
Gordon, P. H...	1C	,,
Holt, Frank H.	2C	Cardiff
Hunter, Peter..	1C	Glasgow
Johnston, John	2C	Belfast
Jones, A. E. ..	2C	Cardiff
Jones, Harry B.	2C	,,
Joseph, D. W...	2C	,,
Laws, William	2C	,,
Mackenzie, G.A.	1C	Glasgow
MacLennan, A.	1C	,,
McTavish, A. C.	2C	,,
Miles, Wm. L.	1C	Cardiff
Murray, G. W.	2C	N.Shields
Phillips, John G.	2C	Falmouth
Reid, William..	1C	Liverpool
Reid, Wm. C...	2C	Cardiff
Rogers, William	2C	Liverpool
Rosser, David J.	2C	Cardiff
Scannell, J. H.	1C	,,
Smellie, Hugh..	2C	Glasgow
Stevenson, Wm.	1C	,,
Stewart, James	1C	,,
Templeton, J. ..	1C	,,
Thomas, G. P.	2C	Cardiff
Todd, Fredk. ..	2C	Glasgow
Walker, James	2C	,,
Webb, Albert C.	2C	Cardiff
Williams, T. E.	1C	,,
Wylie, James F.	2C	Glasgow

January 14th, 1899.

Blackaller, T. ..	2C	London
Clark, John ..	1C	Liverpool
Cornell, Herbert	2C	London
Dibble, Robert	2C	Liverpool
Frost, S. H. ..	1C	London
Hill, Thos. H...	2C	Liverpool
Holl, Harry A.	2C	London
Jones, Robert..	2C	Liverpool
M'Bride, John	2C	Dublin
M'Cance, W. ..	1C	,,
M'Kinnon, D. ..	2C	Leith
Moffat, John C.	1C	Dublin
Payn, Percy ..	2C	London
Picket, A. E. ..	1C	,,
Pocklington, J.	1C	Hull
Porteous, Robert	2C	Leith
Rennie, Wm. ..	2C	Liverpool
Sang, Robert ..	1C	Aberdeen
Todd, Alfred M.	1C	Hull
Waugh, Thos...	1C	Greenock
Wilson, Michael	1C	N.Shields

January 21st, 1899.

Anderson, J. C.	1C	London
Blair, Wm. C...	1C	Glasgow
Brotchie, Robt.	1C	W.H'pool
Burley, T. M...	2C	Plymouth
Cairns, James S.	2C	Glasgow
Clark, C.W.J.R.	2C	Plymouth
Davies, David H.	2C	Cardiff
Duck, R. E. ..	2C	,,
Duff, Walter M.	2C	Dundee
Duff, Wm. A...	1C	W.H'pool
Duncan, Daniel	2C	Glasgow
Easdon, George	1C	,,
Evans, G. W...	2C	W.H'pool
Fraser, James ..	2C	Glasgow
Giffen, A. H. ..	1C	,,
Gledstone, T. A.	1C	W.H'pool
Hamson, Wm.E.	2C	Glasgow
Harley, Andrew	2C	,,
Henderson, T...	1C	,,
Hirst, Chas. W.	1C	Liverpool
Hood, B. R. ..	2C	,,
Howie, John ..	2C	Glasgow
Burrell, Wm...	2C	N.Shields
Jones, W. H. ..	1C	Liverpool
Lindsay, John..	2C	Glasgow
Linnington, W.	2C	London
M'Millen, John	2C	Dundee
Morgan, John..	1C	Glasgow
Nicholls, G. A.	1C	Cardiff
Nicholson, J. J.	2C	N.Shields
Pattie, William	2C	Glasgow
Quelch, A. T. ..	2C	London
Rahe, John W.	1C	Liverpool
Rattray, A. G.	2C	Glasgow
Ronchetti, T.E.	2C	W.H'pool
Signal, William	1C	Glasgow
Speechly, J. S.	2C	W.H'pool
Stephen, H. F.	2C	Glasgow
Stephenson, E.	2C	N.Shields
Stuart, J. E. T.	2C	Dundee
Thorburn, J. D.	2C	N.Shields
Todd, Percy ..	1C	Glasgow
Wardle, R. N.	2C	Liverpool
Williamson, J.	1C	,,
Wilson, R. C...	2C	Glasgow

The Marine Engineer.

LONDON, MARCH 1, 1899.

THE late tempestuous weather in the Channel, resulting chiefly from prevalent south-westerly gales, has drawn attention to the most unsatisfactory state of Dover Harbour under such conditions. So far from the new works and pier, undertaken by the town, having increased the facilities and protection for the mooring of the Channel steamers alongside the piers, the condition of the inside of the harbour in rough weather appears to be worse than before. It has been found that the Channel steamers cannot enter the harbour at all on many days in the month. They have been compelled either to run back to Calais or to land their passengers at Folkestone. This is serious to a port which has hitherto held out and away the highest record of the number of passengers passing through it to and from the Continent. Before the completion of the new pier, lately added, it had been found generally possible to effect a mooring under the lee of the Admiralty Pier, but now the new parallel pier causes a rebound of waves between the two piers that would smash any boat attempting to moor alongside. It would appear that there has been a considerable engineering blunder in the form or relative position of the new pier to the old one. The science of wave interference seems to be little studied as regards the sea, though it has been thoroughly defined and determined by Tyndal as regards sound. The theory and science is the same as regards either sound waves or water waves. Vibrations can accumulate by reason of the relative positions of nodes of rest or faces of reflection until the total volume of disturbance is magnified exceedingly. Or, by the slight alteration of the reflecting faces to one another, reflex waves can be caused to meet and interfere with one another so as to produce absolute quiescence. It is probable that with a heavy south-westerly gale up Channel the waves or rollers are of a usual and ascertainable length and of definite direction. When beating upon a reflecting surface the obliquity of such surface to the direction of impact will have everything to do with the character and direction of the reflux of such waves, and will determine whether the reflex waves augment or destroy the oncoming waves. It would appear that such considerations have been entirely lost sight of or neglected in the arrangement of the interior surfaces and piers of Dover Harbour, resulting in a state of affairs which may pretty nearly ruin the town as a port.

THE novel departures in the hull-framing of the *Oceanic* naturally draws attention to the general principles and disadvantages governing the design and construction of modern sea-going liners, and we come to the conclusion that the advantages that are confidently expected from the improved hull-construction of the *Oceanic* is largely due to the wise resolve of the owners, that her construction shall not be subordinated to the mere carrying and floating of the largest amount of engine and boiler power that can be got into her. We fear that in the usual liner the naval architect is much hampered by the requirements of the marine engineer for a large and lofty engine and boiler-room right in the centre of the vessel, not to speak of the various recesses and carvings away of the main structure required for the numerous auxiliary engines and boilers of modern days. It is well known that a long vessel is but a tubulous girder, and that all laws of mechanics make the bending stresses greatest at the centre of such girder. Now, it is, as a rule, just at the centre of the vessel that accommodation must be found for the roomy engine and boiler-rooms. Nor can the usual deck-beams, decks, pillars, and stringers, which are such important factors to the strength and rigidity of the hull, be continued through the engine-room without regard to the engines that must be placed there; and it is undoubtedly frequently the case that the design desired by the naval architect must be subordinated to the requirements for clear space by the engineer, and that in the part of the hull most liable to the heaviest stresses. It is the greatest credit to the naval architect that he has succeeded under such terribly restrictive conditions in giving such fine and reliable structures to the world as he has hitherto done, but a new era in which a comparatively moderate speed and consequently less exigent requirements for engine and boiler-room are required from liners in comparison with their tonnage will do a great deal towards producing a stronger and more reliable form of hull construction.

THE NEW YOR
PUBLIC LIBRA
ASTOR, LENOX AN
TILDEN FOUNDATIO

KEELEY, of the Keeley motor fame, is dead, and with him has died the long and lingering hopes of those who trusted in his magniloquent promises. His premises have been entered by the credulous simpletons who have sunk apparently over a million of money in their *ignus fatuus* that he was ever dancing before their eyes, and they have discovered what appears to have been but the simple trick of a charlatan. Compressed air seems to have been the only motive force of which the resultant energy was manifested in the Keeley motor, surreptitiously introduced. It is amazing the extent to which credulity in that which is not understood, but which is prodigal enough in its promises, will carry the British public. Keeley's theory was beautiful, that all bodies held together by that mysterious force molecular cohesion, could be caused to loosen their bonds, and thus become gaseous with the development of an enormous energy, at the touch of a magic wand wielded by Keeley. He went so far as to explain the nature of such wand. It was intensity of vibration. But no one could wield it but Keeley. Of course there was sufficient plausibility and substratum of scientific probability in such a theory, to render the pursuit fascinating even to those who thought they knew something. But, apparently, the broad fact was lost sight of, that as all vibration is a mode of motion or a form of energy, it would probably require as much expenditure of force to impart the necessary disruptive vibration as could be afterwards obtained from the expanded product. This is what is being done every day. The product of combustion is probably intensity of vibration, and it is this vibration communicated to water, that causes it to change its form and become steam. But it is well known that the effective energy in such steam cannot be made to reproduce mechanically, as much heat as was required for its disruption or expansion. So with the Keeley theory. It is probable that every body, paving stones and the like, have all their essential point of disruptive vibration. We see this in the melting and vaporizing of metals, but heat has as yet been the only and commercial manner of producing such necessary intensity of vibration. Any other mode of originating such intensity of vibration as would represent the disruption of a solid or liquid body, which is quite a possibility, would at least require a mechanical equivalent of work to the heat that is required to do it in the usual way. Now that the master spirit has gone to his last reckoning perhaps the public, with more money than wits, will be content to either philanthropically endow research, which is scientific research, or to keep their money in their own pockets.

THERE appears to be much diversity of opinion both as to the facts or as to the desirability of circulation in boilers of all or any type. Some years back good circulation, promoted by all sorts of artificial contrivances, was supposed to be the key to good evaporation, and in the first water tube boilers great precautions and forethought were taken to ensure as perfect circulation as possible. Mr. Yarrow's interesting tests and experiments, however, seemed to knock all the preconceived ideas of how circulation was set up, and how circulation continued after it was set up, on the head. When Mr. Yarrow had proved that once a current was flowing downward in a vertical pipe any application of heat to that pipe in no way interfered with, but rather increased such downward circulation, we seemed to be confronted with the perfect paradox of circulation, and to find that we knew little or nothing about it. At the same time it is a curious fact that Scotch or Lancashire boilers are in use daily in which it is well known that there is little or no circulation in the lower parts of such boilers, and yet users will tell you that they are as economical and satisfactory as steam generators as they can be. Galloway tubes and pockets were introduced to cause a direct circulation from the coldest part of such boilers to the crowns of the furnaces, but there are some that tell us, and apparently with good grounds for their knowledge, that such tubes and pockets do not increase the circulation of the water in the lower part of the boiler at all. Some authorities say that excessive circulation is a mischief and but tends to interfere with the free ebullition and escape of the bubbles of steam as they are generated, and that all that is required in a well designed boiler is the ready and free escape of the steam bubbles to the steam chamber, and that the circulation will look after itself. Equally contradictory appears to be the opinions of authorities as to the effect of circulation on deposits on the heating surfaces. The circulation is best if anywhere in the feed-supply pipe to the boiler, and yet that is exactly the part that furs up most quickly; and whatever the circulation over the crown of a furnace, the deposit upon it still seems to go on, particularly of the sulphate character. Yet we see that there is a statement by a French engineer of apparently great research and authority that he is prepared to prove that positive water circulation has a great bearing on the formation of scale. We think our sea-going readers, who so often have the opportunity of seeing the boilers scaled, ought to be able to tell us something practically as to this vexed question, and as to the value of artificial circulation upon the evaporation of boilers.

THE "STANDARD" PATENT OIL SEPARATOR.

THE accompanying illustrations give a sectional elevation (Fig. 1) and plan (Fig. 2) of the "Standard" patent oil separator (W. J. Baker's patent), which is brought under our notice by Messrs. David Bridge & Co., King Street, Salford, Manchester. This apparatus will be found specially applicable to marine engines, for the automatic separation of oil and grease from the exhaust steam on its way to the condenser. Hitherto, practically the only means adopted to attain the above object has been the filtration of the condensed water. This plan is open to many objections; the filtering medium in time becomes choked and ineffective, and requires constant attention, whilst even then water can only be forced through it at very high pressure, taking grease with it, which is usually found afterwards upon the inner surface of the boilers. It is to replace the above unsatisfactory system that the "Standard" separator has been designed. In this apparatus the steam, on entering by the exhaust inlet, is allowed ample space for expansion, which lowers the temperature, rendering the steam incapable of holding in a gaseous state the oil it carried at the greater heat. The expansion in a larger area also causes the current of steam to travel more slowly, whereby the molecules of grease are enabled to attach themselves to any obstacles with which they come in contact. Immediately the steam enters the separator its direction is changed by means of a deflector, which projects the current downward upon the surface of water in the "well" at the bottom, the greasy spray and particles suspended in the steam being attracted and retained by the water, and ultimately carried away by the grease overflow pipe. The small portion of the steam which may escape the purifying influence of contact with the water surface has finally to pass between several rows of vertically placed angle-iron bafflers, which are so arranged that the steam is compelled to impinge upon them, leaving the remainder of its grease to flow down into the well. The aggregate space between the angle-irons is made much greater than the area of the pipe to prevent back pressure. The separated grease can be collected, filtered, and used again. When this separator is adopted in conjunction with a surface condenser the resultant water is quite free from grease and other impurities, and can be advantageously used for boiler-feed and other purposes. Our illustrations Fig. 1 shows a sectional elevation of a cylindrical pattern of this separator, and Fig. 2 a sectional plan of a square rivetted pattern, illustrating the arrangement of the angle-iron bafflers.

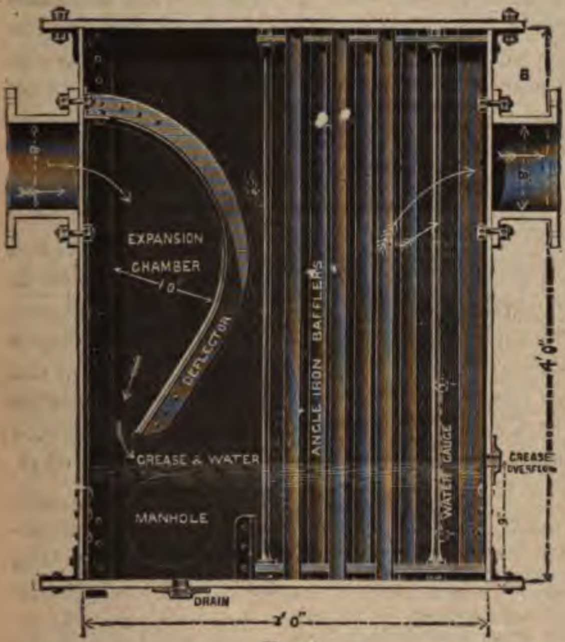


FIG. 1.

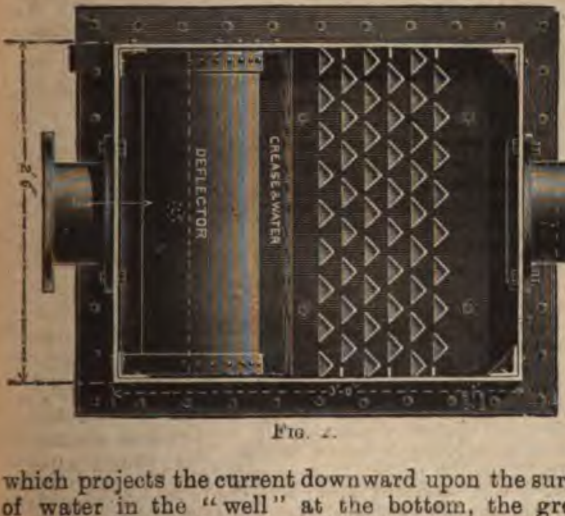


FIG. 2.

THE FLEETS OF THE MAIL LINES.

(*From our own Correspondent.*)

The Winter of 1898-99

will certainly be a memorable one for the unprecedently bad weather which has characterised it. In both the last two instalments of these notes I have commented on the severity of the weather. Yet the more recent period has been worse than ever. The *Lucania* was nearly eight days out to New York at the beginning of February, and on this trip did on one day but 121 nautical miles, that is, a speed of about five knots for the twenty-four hours. She, however, sustained no damage. The *Etruria* a week later was nearly a day longer. A sensational account of a narrow escape from collision between her and a United States cruiser has been published. The *Teutonic* also made a slow trip of seven days and twenty-three hours out, but the *Paris* was only just under ten days, whilst the *Lahn*, one of the most regular of the Nord-deutscher Lloyd Express boats took nine days from Southampton to New York. Going the other way the ancient Cunarder *Catalonia* was fifteen days from Boston. But these are records of mere delays, though they show plainly enough that the weather was unusual. There are much more serious events to chronicle.

The Hamburg American Line had no less than three of their cargo vessels in the overdue list on one day—the 15th of February. One of these was the *Moravia*, bound to Portland, Maine, on which ten guineas was being paid for re-insurances. She is a vessel sixteen years old. The second was the *Bosnia*, on which a similar premium was demanded. This vessel, which is a twin screw steamer just built at Newcastle by Messrs. Palmer's, was on her maiden trip to Baltimore. She arrived safely next day, however, having been two days over three weeks since she had passed Dover outwards. The last of the three was the *Bulgaria*, which had really excited serious anxiety, as no less than eighty guineas was being paid for re-insurances upon her in view of the news brought concerning her by the *Weehawken*. The case of the *Bulgaria* I will refer to at length in a later paragraph. The *Pretoria*, a similar vessel, belonging to the same owners, was also disabled by injuries sustained by her rudder when 871 miles west of the Bishop Rock. Her twin screws, however, afforded her a rough means of assisting her temporary steering gear, and she was safely brought back to Plymouth. This is a catalogue of misfortunes enough to satisfy even the biggest of the Atlantic Companies. But others were in equally bad plight.

The Angier Line "Angers,"

which sailed from London on the 15th January, was sighted in lat. 34 N. long 43 W., with loss of rudder and leaky. On the 6th February, the British steamship *Dunraven*, which reported her, was unable to assist her in any way, and anxiety on her behalf naturally ran very high. She has, however, been towed into the Azores. A very large number of steamers have been and are seriously overdue. It would seem that in this spell of severe weather there have been a less important number of breakings of shafts reported than has usually been the case, and a greater proportion than the average of disablements of steering gear. Whether—as has before suggested itself—the shipbuilder of the day has failed to quite realise the immense strains which modern vessels place on their rudders or not, the question of improving the steering appliances seems a very important and urgent one.

The North German Lloyd Company

has issued a notice that, in view of confusion which it alleges has arisen in the past through the fact that its name in Germany is Norddeutscher Lloyd, and that in England it is North German Lloyd, it desires in future to be known everywhere as the Nord-Deutscher Lloyd Company. The people who could have been confused by so simple a matter must have been a very feeble folk. But the advertisement agents and stationers will be made busy in consequence of the change, so it will benefit somebody.

The Naval Notes in the "Globe"

are occasionally amusing to those who are interested in the fleets of the mail lines, when the writer, who appears to be an old-fashioned naval man, condescends to notice our affairs at all. His extraordinary remarks—before the performances of the American Line steamers in the Hispano-American War crystallised opinion on the subject—on the value of our auxiliary mercantile cruisers will not be forgotten. Now, on February 17th, he began his notes with the remark, "I do not remember in all my experience such an accident as that just reported from H.M.S. *Edgar*. Certainly it is unique and unprecedented in the Royal Navy." The accident to which he referred was the rolling out (or off) of the foremost funnel of that cruiser. It is not for me here to discuss whether such a catastrophe is or is not unprecedented in the Royal Navy. His remarks suggest plainly enough that he considers that it is unexampled anywhere. This is an absolute and entire mistake. In the mercantile marine such accidents are not uncommon. I will just cite two: A few days before he wrote his notes, the *Catania*, of New York, bound west, was reported at the Azores with heavy deck damage, including loss of funnel; and the very day after his notes were printed, the Austrian steamship *Hermine* put into St. Michael's with report that she had sighted the Johnston liner *Rossmore*, abandoned, and with bridge, funnel, and boats gone. This correspondent seems to think that elliptical funnels are the cause of the *Edgar's* disaster. I do not think either of the merchant vessels now named had elliptical funnels, and I certainly remember years ago seeing the Cunard liner *Servia*, on arrival at Liverpool, with her forward funnel—a circular one—flattened like a bandbox by a heavy sea. I should recommend this gentleman a course of study of the disaster columns of the shipping papers, or even of the *Times*, before he begins to generalise again.

The Navy League

is bestowing a good deal of attention on the subject of foreigners in the merchant service. It is anxious to get a better plan than that put forward by Mr. Ritchie, the President of the Board of Trade, last year for the purpose of inducing or enabling British boys to enter and find employment under reasonable conditions in the British Mercantile Marine. Into the spirit of these endeavours Mr. A. L. Jones, the managing partner of Messrs. Elder, Dempster & Co., is entering heart and soul. He is willing to give every assistance he can to the object in view. But he has hardly conciliated the Board of Trade by his absolute refusal to take advantage of the trifling remission of the Light Dues which the Government offers as an inducement to shipowners to fall in with the idea which all parties wish to see elaborated to an effective point. He considers that the whole system of levying light dues on shipowners for what he conceives to be a national work is unjust and wrong. He therefore, as he cannot refuse to pay them, altogether refuses to have any part of them remitted; and, if he carries boys for patriotic purposes, will try the experiment wholly without Government aid.

The P. & O. Company's "China"

is again occupying a prominent space in the columns of the daily press. She has been repaired at Perim and, after a successful trial, left on the 7th February for England under the convoy of the two large steamers *Berger Wilhelm* and *Berthilde*. She traversed the Red Sea in safety, though at a very reduced speed, and is now to proceed to Belfast for permanent repairs. *She will, however,* as soon as she reaches home, occupy a still more prominent position in the papers. For the re-hearing of the Board of Trade inquiry into the stranding on Azalea Reef was fixed for the 23rd February, before the Admiralty Court. As February is a short month I must defer any further reference to the matter till the next issue of these notes.

The White Star Line

has brought home from the Pacific station its old *Belgic* after an absence of many years. Launched from the Queen's Island yard in January, 1885, she went out to Sydney on her maiden trip, and from that port proceeded to run in their service from San Francisco to Yokohama and Hong Kong, where so many of her sisters have done good work. There she has been employed ever since. She left Manila homeward bound on the 2nd January of the present year, and after a short visit to London arrived in the Mersey on the 17th February. She left three of her line in the Pacific service. These are the *Doric* whose outward passage was so memorable from the fact that she established a world's record for long distance steaming, going from Liverpool *via* Cape Horn to San Francisco without a stop, the *Coptic*, formerly like the *Doric* in the New Zealand service, and the *Gaelic*, which is the *Belgic's* own sister. This is the usual number of the White Star vessels in these waters. The old *Adriatic*, whose sailing I mentioned in the last set of notes, did not reach Preston till mid February, as she encountered one of the numerous heavy gales which have recently been so prevalent, and put back for a time to the Mersey. The new 12,000-tonner *Afric* started on her maiden trip on the 8th February, and managed thus to get what will probably be the worst weather she will ever encounter on her maiden effort.

The National Line.

By the way, talking of 12,000-tonners reminds me—by a somewhat indirect process—of the old National Company which has become a side show to the Atlantic Transport Line. The company has disposed of the *Mississippi* and the *Michigan* which it took from its foster parents fleet. It was thus reduced to its two old ships *America* and *Europe*. To these has now been added the *Manhattan* a fine twin-screw cargo-boat built at Belfast by Messrs. Harland & Wolff. Her register tonnage is 6,124 net and 8,004 gross, a fine big ship enough. Yet in the advertisements of the line she appeared as "*Manhattan* 12,000 tons"! When this appears on the same page as the true gross register of the vessels of other lines it can only tend to mislead the unwary, and to disgust those who know the truth. Messrs. Williams, Torrey & Feild have followed the same practice with their Atlantic Transport ships—the *Mesaba*, a sister to the ill-fated *Mohegan*—appearing as of 8.500 tons, whilst her gross register is 6,833 tons by the Registrar General of Shipping's list, and the *Minnesota* standing as 5,000 tons, whilst her gross register (at least when she was new) does not exceed 3,300 tons. These tonnages published in the bills may be "displacement tonnages." But when other lines give gross register this does not compare on an equal basis, and perhaps now that their attention has been called to it, the managers will see that their advertisement clerk follows the usual practice of shipping companies. The National Company, from its report, seems to have done very well in 1898, and we may hope that the shareholders are more satisfied with their luck than they were a year ago. It is evident that if good management and knowledge of the conditions of the Atlantic trade can ever put the old concern in a flourishing condition, the firm who now have the control of the business are the people to do it.

The "Isis,"

of the P. & O. Company has been running very well between Port Said and Brindisi lately with the Australian and Indian mails. The distance is, I may tell the *Morning Post's* Rome correspondent, 940 nautical miles, not a thousand, as he states it. Six per cent. on a distance, especially when he comes to estimating speed, means a good deal. The passage was made by this vessel in forty-six hours fourteen minutes at the close of January, and the speed attained was 20·32 knots. A correct report of this achievement appeared in the Liverpool *Journal of Commerce* on the 7th February. On the 11th the *Morning Post* published its version under date "*Rome 10th February.*" By that time the *Isis* had made another round trip, and it would have appeared that the report from Rome dealt with the later passage. But this was by no means so good. One could hardly expect that two consecutive trips could be. But the London paper, or those who gave it the news, by adding the sixty miles of the distance run, managed to make the speed appear a good six-tenths of a knot better than it actually was. The speed is, however, most creditable as it stands. The vessels are a distinct gain to the Company whose flag they fly. I cannot, however, quite understand why they wait at Port Said for the mails. Coaling there, of course, one understands. But I should have fancied that a considerable further economy of time might have taken place if the mails were taken overland to Suez and put aboard the waiting mail steamer there. It takes a mail vessel even now three quarters of a day to traverse the ditch, and one would have imagined that mails could have got to Suez quicker than that.

The Board of Trade Inquiry

into the loss of the *Londonian* showed, as one would have expected, that she was in every way a well-found and well-built ship. Her officers and men did their duty by her. She was lost through a piece of cotton waste. A steam gearing gear of a type which is approved alike on theoretical and practical grounds, was fitted to her, and its installation involves the use of cogs on the quadrant, and on the wheels actuating it. It was the duty of the ship's carpenter to clean the gear each day, and on the fateful morning it is believed that this unfortunate fellow—who lost his life in the disaster—dropped his waste into the box which covered the gear. This worked its way in the teeth, and, at a critical moment in the heavy wind and sea which then prevailed, the rudder jammed ere it could be cleared, the ship fell off into the trough of the sea, the cattle shifted bodily to leeward, the cargo below followed suit, and the list which this brought about was so great that the engines were stopped, as the condensers could get no circulating water. By the time the steering gear cleared it was too late. The rudder was powerless to bring the vessel to the wind, and the result was what we have all heard.

The Allan Line

is getting its fleet ready for the improved service. Their new steamer *Castilian* has passed her trials satisfactorily. She took the sailing of the 23rd February. She is of good size and of fair speed. But she is not a 20-knotter, nor has she twin screws. However, she is far more than equal to the *Fulda*, *Werra*, and *Gaspesia* of the Canadian Steamship Company. Two other and superior ships are promised to run with her, whilst the fourth of the quartet will be the old *Parisian*, now being re-engined, re-boilered, and improved in her passenger accommodation by Messrs. Robert Napier & Sons, who constructed her eighteen years ago. She has, it is said, made 147 round trips, and carried 121,600 passengers across the Atlantic without accident of any kind. Meanwhile

The Canadian Steamship Company

has been having bad luck indeed. The two steamers *Werra* and *Fulda*, which were said to be under engagement to run in its service next season, finished their work of transporting Spanish troops from Cuba to the Peninsula, and came round to Liverpool, where they were dry docked. To the *Fulda* an unaccountable and unusual accident occurred. She either slipped off or cut through the blocks when the water left her, and sustained serious damage, her plates being holed and her fabric strained. At the same time the *Gaspesia* was in trouble. She left Milford on her second voyage on the 11th January. On the 24th she was reported from Quebec as "being sighted three miles south-east of L'Anse aux Gascons, making slow headway through the scattered ice." Then the fear was expressed that she "was frozen in an ice floe in the Gulf of St. Lawrence," and with comforting suggestion added that it "might be weeks before she effected her escape." This fear, however, was not realised, as she was on the 16th reported clear of the ice, and *en route* for St. John, New Brunswick. But the date of her third sailing had to be postponed at first from the 4th February to the 15th, and finally left uncertain altogether. This is indeed an unfortunate experience for the new route that was to be ice-free all the year round. But the winter has been a most exceptional one. One could never have anticipated that a White Star steamer would be nipped by the ice and sunk at her dock in New York. Yet this fate has actually befallen the *Germanic*, which was nipped by ice at her berth in New York on the night of the 13th February. The first story seems to have led to the suggestion that here was a repetition of the *Austral* disaster in Sydney Harbour, or of the *Orotava* catastrophe in Tilbury Dock. Whilst, however, the White Star experience is fortunately distinguished from that of the Orient Line on these two occasions, by the fact of there being no loss of life at New York, it now seems to have also differed in its cause. Both the Orient vessels I have named heeled over and filled owing to carelessness or mismanagement in the management of the coaling which was taking place at the time. Though the *Germanic* certainly was coaling, the conduct of that operation seems to have had nothing to do with the accident. That was entirely due to the pressure of the ice. For that reason, whilst the accident is annoying and inconvenient, as well as I fear very expensive, there is no cause for dissatisfaction by the owners either with their own rules or with the manner in which their employees fulfilled their duties. The accident was a pure accident and nothing more.

The American Mails

of the 15th February were to have been despatched by the *Germanic*. In consequence of the matter above referred to, she was, of course, unable to take them. The American Line were also, from accidents which had befallen their vessels, unable to take the sailing, and it looked as if the mail would have to wait for the Saturday Cunarder. There is no Boston Cunarder now on the station that could have landed her mails before the boat from New York even with two days start. But the Dominion Line came to the rescue. Their steamer *Canada* was appointed to sail for Liverpool on Thursday the 16th, and to her the mail was entrusted. Thus the Dominion Line has again shewn that the despised passenger trade to Boston is a factor well worth consideration.

The White Star Liner *Cymric* arrived at New York on Friday, the 17th, and she will be able to take the *Germanic's* place, if need be. Speaking of

The Dominion Line,

the announcement is made that during the passenger season this year the fortnightly service now so ably maintained by them, between Boston and Liverpool, will be made a weekly one. The *New England* and the *Canada* will be reinforced by the accession, for the time, of the twin screw steamer *Derbyshire* to the fleet. This vessel is the newest and finest of the favourite Bibby line of steamers to Rangoon. That Company has already lent one of its vessels, the *Yorkshire*, to the Dominion Company, and it would appear that the example of the North German Lloyd Company, which runs its four big twin screw vessels to the South and East in the winter, when the Atlantic trade is dull, and as an intermediate weekly service to New York when passenger business thither is brisk, is to be copied by these enterprising Companies. There will be thus three splendid steamers on the station, and the *Dominion* is well worthy to take the place of fourth in this twin screw passenger service.

The Nord-Deutscher Lloyd Line

announces another development. This is a Transpacific line from Hong Kong, via Yokohama, to Seattle, in Washington State, U.S.A., in opposition to the Canadian Pacific steamers, whose headquarters are at Victoria, B.C.

Old Cunarders.

I mentioned last year that the old *British Queen*, then forty-nine years old, had been sold out of the Cunard fleet. Since the sale she has been lying at Liverpool in the Huskisson Dock On the 17th February she completed her last trip, arriving at Preston where she will, alongside the old White Star steamer *Adriatic*, be broken up.

Another aged Cunarder, the *Tarifa*, has also been disposed of This vessel dates from the year 1865, when she was built by Messrs. J. & C. Thomson, of Clydebank. She is about 2,100 tons gross register. In 1879 she was fitted with new engines and boilers, on the compound principle, by Messrs. J. Jack & Co., of Liverpool. Her purchasers are an Italian firm who have sent her out with a cargo of coal, and she too, on arrival, is to be dispersed into old iron. The oldest class of Cunarders is now at last reduced to two These are the *Aleppo*, which is practically a sister ship to the *Tarifa*, and which came from the same yard. She has, however, had a third set of engines and boilers, being now tripled. The other is the *Samaria* which is again by the same builders, but 500 tons bigger and three years younger. The *Samaria* was for many years employed in the Boston trade. But of late she has been sent to the Mediterranean, where both she and the *Aleppo* are kept busy. I am curious to see if some shareholder will not at length pluck up courage to ask why these antediluvians—and some even younger ships of the fleet—are not at length disposed of to keep down the repair and coal bills.

The Adventures of the Pavonia

have been remarkable indeed, and almost unprecedented. She left Liverpool, on her westward voyage, under Captain Atkin, on the 24th January. The crew numbered 113, and she had eight passengrs in the saloon and about sixteen in the other cabins. On the 24th she was struck by a hurricane and lay twenty hours in the trough of the sea. Her troubles were renewed on the 2nd February, till at 3.20 p.m. on the 3rd., in a heavy sea and a heavy gale from the north-west her boilers went adrift, and the machinery thereupon became, and continued to be, useless. Four hours later the Wilson liner *Colorado*, of Hull, was sighted. At 6.30 a.m. the following morning she responded to the signals, and shortly after 9 a.m. commenced towing. In twenty minutes, however, her bitts carried away, and other damage ensued which precluded the possibility of a renewal of the attempt. But the would-be salvor stood by till the vessels parted on the night of the fifth. Meanwhile those in charge of the *Pavonia* had been busy indeed. They were fighting down below in the stokehold to block up the boiler feed-pipes which were now pouring water into the vessel, and at the same time striving to wedge up the displaced boilers. How they achieved their object has not yet been explained, and it seems incredible that they could have succeeded in a plunging ship. But succeed they did. At 3 a.m. on the 9th the *Horatio*, of Liverpool, came up, but had to refuse assistance. After this disappointment, however, the unhappy passengers and crew were practically through their troubles. The *Wolviston*, of Hartlepool, came up at noon on the 10th, and that afternoon towed for seven-and-a-half hours till the ropes parted. It was not till 7.30 a.m. on the 14th that she was able to recommence work, but this time she was enabled to continue, and finished her task off Ponta Delgada, in the Azores, at noon, on the 18th, having towed altogether about four-and-a-half days.

But, though the passengers were now got ashore, the anxieties of the crew were not concluded, for the vessel could not get into the inner harbour, and there was great danger of her dragging ashore in her disabled state, having no machinery to use in relief of her ground tackle. The crew expressed their belief in her eventual safety, and the event proved that their confidence was well founded, but the reality of the peril was proved by the fate which actually befell the Italian barque which lay near her, and which, less fortunate than she, went ashore, and became a total loss, though happily her crew were saved.

The *Pavonia* herself is to be towed back to Liverpool, tugs having immediately been despatched to fetch her. The *Catalonia*, leaving Liverpool on the 21st February, is appointed to call at St. Michael's, Azores, to take on her passengers. The conduct of all concerned with the management of the vessel in so unprecedented a predicament must have been beyond all praise, though at present details are wanting. All we know is that by the time she reached the Azores Captain Atkin reported her as "making no water," and stated that the boilers were secured.

The daily press, of course, had its little say on the occasion. The *Daily Telegraph* told us that the *Colorado* had arrived at Hull, when, in fact, she had but put into the Azores, and dished up the old remark about Cunard's having never lost "a ship or a passenger." They also started a new tale—of whose source I can make no suggestion—to the effect that the Cunard service celebrated its fifty years of Atlantic service last year. In point of fact, as we all know, the service is fifty-nine years old, having been inaugurated in 1840. A confusion between the origin of the Boston and New York services cannot have originated this mistake, as in their earlier years Boston was their sole port in the United States.

The Fate of the "Bulgaria"

is more obscure at the time of writing. The fears in regard to her are expressed by the rates of re-insurance, which have some time ago reached ninety guineas per cent., whilst those of the *Pavonia* never reached more than a quarter of that figure. She is eastward bound, having left New York on the 28th January. She was sighted in lat. 40, N., long. 43, W., on the 5th February by the s.s. *Weehawken*, which put into the Azores with loss of boats, and with bunkers full of water, but having, nevertheless, succeeded in taking off twenty-five women and children of the passengers. There seems to have been some confusion as to the exact injuries which the furious Atlantic had inflicted upon the disabled liner. All reports agree that her steering-gear was damaged beyond repair. Some accounts tell us that she had three of her eleven compartments full of water, and that she was sinking. Others again say that she had only water in one hold. It seems doubtful as to the true state of her propelling machinery at this junction. Still two steamers was standing by when the *Weehawken* proceeded. One of them was probable the *Koordistan*, which has since arrived in port without giving us any further news of importance, or bringing in any of her people. But there is still hope that the third vessel may have been able to complete the rescue even if the *Bulgaria* herself has to be added to the long list of this winter's casualties.

A Minimum Load Line.

Captain Froud has circulated a letter and a snap-shop picture amongst the Press in which he emphasises the necessity for a minimum load line, as well as a maximum one in cargo vessels. His picture—which is checked in regard to its angles by the horizon line—shows the vessels rolling through her too light condition to an angle of 45 deg., a condition which, as he truly points out, does certainly not conduce to her safety, to the comfort of those on board, or to anything but the detriment of her machinery and hull. This is a matter which—if it be brought forward by a shipmaster—is quite as vital to engineers as to the navigating branch

WALLACH BROS. & CO.

FIREMEN and miners have often to incur the dangers of an atmosphere which does not support respiration. Statistics prove that most of those killed in explosions in mines are suffocated. Consequently it is of the utmost importance for a rescue party as numerous as possible to descend at once after an explosion or after an underground fire. Often gases accumulate in tank steamers and coalbunkers, and it is necessary in such cases to investigate the matter. In such cases this apparatus would be invaluable.

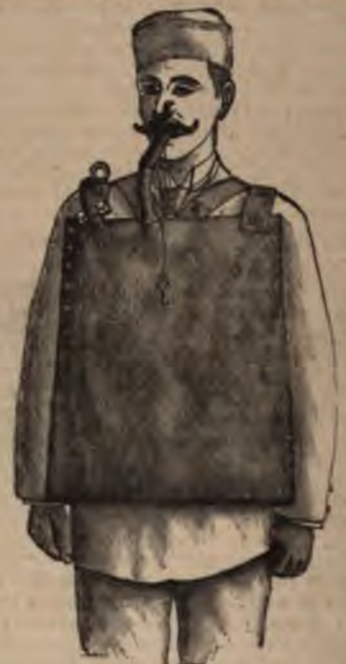


FIG. 1.

Messrs. Wallach Bros., 57, Gracechurch Street, London, E.C., have placed on the market an apparatus called the Pneumatophor, for supplying pure air to those requiring to enter poisonous atmospheres. It consists of a bag containing air strapped on front and back of the user, and with a tube leading from it to the mouth. We show the breathing bag, Figs. 1 and 2. It is 450 mm. broad, and 550 mm. in length, and made of gas-proof stuff. There are two loofah pads inside the bag to absorb the caustic soda solution.

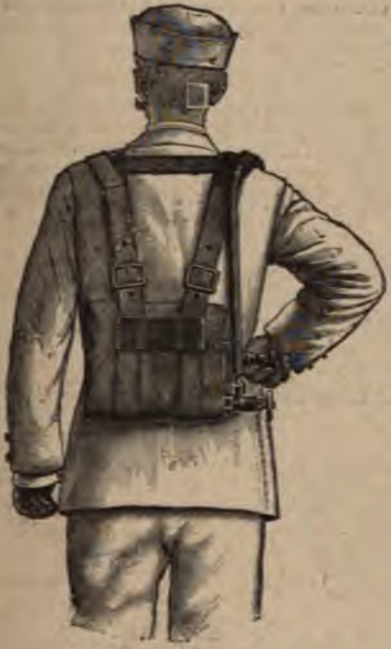


Fig.

In the middle of the top of the bag is the breathing-pipe, a simple pipe without a valve, with its ebonite or india-rubber mouthpiece. By the side of it is the opening for the screw for the caustic soda apparatus. On the right side of the bag is the slit, by means of which the caustic soda apparatus and the oxygen cylinder are inserted in the bag. This slit also enables one to turn the bag inside out after being used. The two metal plates close the slit gas tight, while at the same time they serve to hold fast the neck of the oxygen cylinder, the wheel of the oxygen cylinder remaining outside. Attached to the middle of the bag and the right corner are the removable straps, by which the bag is carried. They are passed over the shoulders, under the arms, and fastened on the chest with hooks and eyes. A strap serves to unite the other two straps, and to support the bag until they are fastened. The vessel for holding the oxygen is a seamless steel cylinder tested for 250 atmospheres with a capacity for 0·6 litres. At a pressure of 100 atmospheres it holds 60 litres of oxygen. In the neck of the bottle is a valve, on the mouth of which is the out-let pipe. The side opening of this pipe is turned towards the middle of the bottom of the caustic soda apparatus to prevent the stream of oxygen, when coming out, from scattering the caustic soda which clings to the sides of the bag. The valve is worked by means of the hand wheel from the outside of the bag. The caustic soda apparatus is a cylinder of perforated sheet-metal containing a glass bottle with an india-rubber stopper, and it contains 425 cubic centimetres of 40 per cent. solution of caustic soda. It is 200 mm. long and has a diameter of 80 mm. at the bottom. There is an iron ring between the bottle and the metal cover, to which is attached the female screw in which the former screw works.

Turning this screw breaks the glass bottle inside the metal cylinder. The screw presses in the metal plate, which causes complete breakage of the bottle. The oxygen is inhaled through the breathing-pipe. The breathing should be as regular as possible. Only a small part of the oxygen inhaled at one breath is absorbed by the lungs. Consequently, the air breathed consists of about 4 per cent. carbonic acid, and about 96 per cent. oxygen. The carbonic acid is absorbed by the caustic soda, which wets the loofah pads, whereas the oxygen is breathed again. It is that which makes so small a quantity of oxygen last so long. The oxygen will last at least an hour if the breather is quiet, stands, lies, or moves about. If he runs or works, the oxygen will last at least half-an-hour.

Water gauge glasses for steam boilers are always a source of danger to the engineer. The high pressures of steam now used in water tube boilers cause them to be still more dangerous, because they are under higher pressure, and exposed to greater temperature, and when they do give way the result is often disastrous. Men are scalded, and in some cases they have lost their lives before anything could be done to stop the issuing water and steam. Some makers use a self-closing arrangement at the top and bottom of their water gauge glass, others have self-closing gauge cocks. Guards have been placed round the glass, but these have merely obstructed the view, without greatly preventing the water doing injury when the glass breaks.

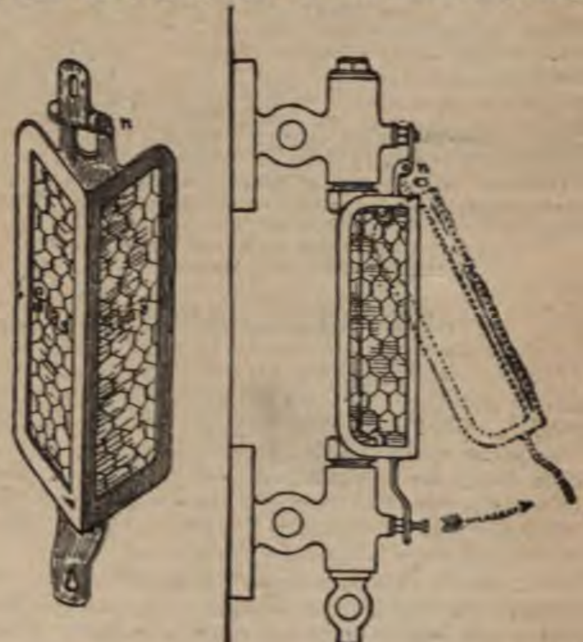


Fig. 3.

Messrs. Wallach Bros., of 57, Gracechurch Street, London, have introduced a novel method of overcoming the difficulty. They place in front of the gauge glass a thick sheet of glass of the shape of a horse-shoe in place, so that it encloses the glass at the sides and front. Embedded within this glass is a wire-netting, which, in the case of fracture, holds it together. It is almost difficult to see from a front view that the netting is embedded. Only when looked at from the end can this be seen quite clearly. The netting is about $\frac{1}{2}$ mesh, and as the glass is fairly thick, there is no chance of the escaping water or steam injuring the stoker, nor is there any chance of the glass flying into splinters. The guards can be easily fitted to any gauge glass without making any alteration. Two brass yokes clip on to the union nuts of the gauge cocks, and from them two spiral springs embrace the glass guard.

The gauge glass is seen through the guard, the part with water in it is marked with dark and light band, while that part containing steam is backed by dots. This very clear method of indication is brought about by placing a half tube pierced with three rows of holes, and coated with white enamel behind the gauge glass. This half tube becomes a cylindrical lens where the tube is filled with water, and the rays of light which pass through it are spread out and make a dot appear like a line, and a disc like a band. The empty part of the tube does not affect the shapes of the objects seen through it, and so the distinctive water level is plainly marked.

Another shape has lately been constructed, viz., the protector, which is shown in Fig. 3, pattern A. It is held by clips embracing the nut. There is another pattern which allows the protector to be fastened at the top and bottom with small screws. It is shown unfastened and lifted up at the bottom. The protectors are attached to water gauges by passing the pivoted clamp over the screw socket of top gauge fitting, after having removed the top gauge glass nut, then the set screw of clamp is tightened and the nut re-fitted. The lower end of the protector is provided with a spring clip, which is fixed to the bottom of the gauge fitting.

NEW PATENT UNION NUT.

THIS nut, which we illustrate, consists of two parts similar in form and semi-circular in cross-section, as in Fig. 4, each part being provided with a transverse groove and interlocking projections or shoulders; the separate parts are placed one on each side of the pipe, and then slid along until they meet, when they form a complete nut, as in Fig. 3, which can then be screwed on to the screwed part of the union as in Fig. 1, and it will be found that the separate parts are securely locked together as soon as the nut begins to pass on to the screw as shown in section in Fig. 2.

The nut is intended to replace the common union nut used for coupling small pipes, stuffing boxes, &c.

If the thread in a common nut on a pipe union is destroyed, either through wear and tear or through carelessness by not having the two parts of the pipe in a line when attempting to couple same, a new nut is required, which, in most cases, necessitates the cutting off of the pipe collar, and after the nut has been replaced said collar must be brazed on again. By adopting a patent nut the old nut can be slid along the pipe and one of the new ones slipped on in front of it without cutting the pipe.

If a patent nut is stripped and a new one is not at hand the old one may still be employed; a small amount filed off the off side of the grooves and a thin liner sweated on to the inside of the shoulders will bring the two parts closer together, and will do until a new nut can be procured.

Fig. 1

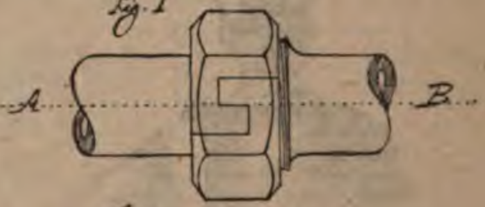


Fig. 2.

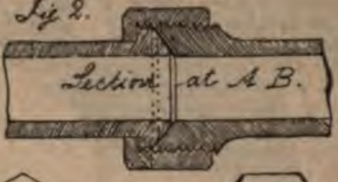


Fig 3

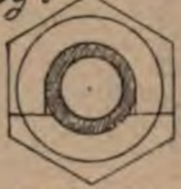
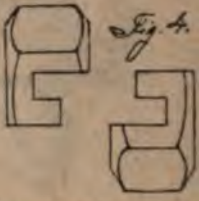


Fig. 4.



Further particulars may be obtained from Mr. V. A. Jensen, the inventor, at 91, Minories, London, E.

MARINE ENGINEERS' NOTES.

(*From our own Correspondent.*)

THE *Matiana*, chief engineer, Mr. Highet, has sailed for Calcutta, and the *Minerva*, chief engineer (Spiers) sails next Friday. The *Manhattan*, the biggest steamer which has been in the London Docks, has arrived at Gravesend. She is an Atlantic transport steamer, and will discharge at the London Docks; chief engineer McLean. The weather has been so cold that as the steamer sailed into New York harbour the spray fell in ice.

There is an interesting article by Mr. Wm. Allingham on British Seamen and Foreigners in the *Nautical Magazine* for February. The occasion of this article was the views expressed by shipowners at the meeting of the Scottish Shipmasters' Association on the question of master, mate, engineer and licensed pilot being British subjects. Mr. Raeburn said that during the course of the year there had been "innumerable instances where most of a British crew during the sojourn at a foreign port were relegated to gaol." Another shipowner was written to by his ship's master "beseeching him to give him Scandinavian rather than British crews." Admiral Hornby again told the world that "Shipowners complain that they are obliged to employ many of those foreigners as mates and even as captains for want of competent Englishmen." Yet Mr. Allingham points out that Messrs. Runniman and Nicholson have shown "that seamen of British birth can be trained under the red ensign at little more expense than the foreigners." British shipmasters take no interest in the training of their men, and Scandinavians suit them admirably. "But in the moment of peril the many attributes which appear to commend the foreigner are the dangerous ones, as witness the Lascars of the *ElDorado* and the Spaniards of the *Ailsa*, when they left the passengers to look after themselves." At the annual meeting of the Society for Missions to Seamen, Admiral Sir R. Vesey Hamilton said merchant seamen are "very sturdy, honest and sober, but apparently a downtrodden class of men." Captain Wait, marine superintendent of the Union Line, employs nothing but Britishers. Captain Luke, of the Orient Line, awards the palm to the British born seaman. In 1846, by the navigation laws, the shipowner was "compelled to employ exclusively the highest paid and most expensively fed seamen—those of native birth." The navigation laws went, and we have not heard of any improvement following.

There was a meeting of the Institute of Marine Engineers on Feb. 13th at the Institute Premises, Romford Road, when Mr. Adamson's paper was again under discussion. The meeting had the advantage of an excellent chairman in Mr. Boyle. Mr. Boyle is an orator of no mean order, but he has a greater gift than that; he knows how to gauge the feeling of a meeting, and guide and lead it without obtruding any remarks of his own. Mr. Ruthven amused the members by explaining to them a diagram designed to show by means of curves the muscular power the handicraft education, the scientific education, and the ability to govern at different ages of life. Mr. Halliday did not agree with Mr. Ruthven as to the shape of the curve representing the income of a human factor. He was afraid that Mr. Ruthven had forgotten that it was possible to get below the atmospheric line, and get amongst the minor quantities. Incomes were not always regularly increasing as Mr. Ruthven would have them believe. There were often ups and downs. Mr. Lawrie thought the presidential address had quickened the interest in the paper, because Dr. Inglis had suggested that perhaps the German drill-sergeant had some beneficial effect on the youth of that country, and that some of our apprentices would be the better for a similar course of treatment, as a means of instilling into their minds some respect for law and order. He did not agree with this view. The home training of the youth before he entered the workshop should be directed towards strengthening the moral qualities, and he used the term in its widest sense, because it was immoral for a youth to scurry or evade his work. Mr. McLaren urged that apprentices should be allowed to study in the day time, and while he deprecated the introduction of trades unionism into the discussion of the institute, he thought that employers were sometimes to blame for much that was attributed to trades unionism. Mr. Boyle summed up, and said the foundation of the education of young engineers should be mechanical education, not only an education of the head. The natural aptitude of one man was greatly superior to that of another, but astonishingly good work was done by imperfect men—by men not of the highest ability. It was not everyone who had the faculty of thinking promptly—that keen perception of what was best to be done in an engineering difficulty—but at the same time there were qualities that were the natural birthright of all, and those qualities could be cultivated.

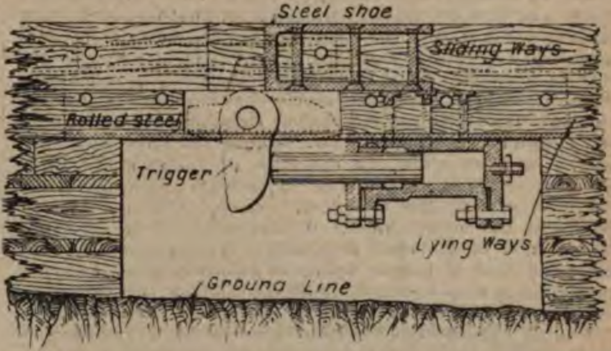
The voting papers for the election of the officers and council of the Institute of Marine Engineers have now been distributed amongst the members. The work of Mr. Adamson during the past year will commend itself to the members. Hardly ever has the work of the Institute stood so well before the engineering public as it has in the last twelve months. The president's address called forth leading articles in the columns of *The Engineer* and *Engineering*, and it was published in many of the other technical journals. The paper on feed-water heaters because of the originality of views, also was commented on in most of the technical papers, and *The Engineer* gave its first leading article to it. Both in the quality of the papers read and the president's address Mr. Adamson has every reason to congratulate himself. But we have reason to believe that Mr. Adamson does not intend to stop there. Mr. Adamson has further views. Views as to original experimental work, views as to the development of the museum, views as to practice in electric fitting, for the younger members of the Institute he has no end of views and being a supreme organiser he knows when to push a thing forward and when to hold it back. The progress of the last year augurs well for the work of the next decade.

The original experimental work which was advocated strongly in these columns to be taken up by the Institute of Marine Engineers for the advancement of Marine Engineering science has been successful. The first experiments undertaken, those on the question of circulation have resulted in a good design of a water tube boiler, which will have a high efficiency in circulation. Following up the views laid down in the paper on water tube boilers as to the advantage of rapid movement of the water over the heating surface, and that on transmission of heat through plates where other advantageous principles were referred to, the new design will embody these advantages.

HYDRAULIC LAUNCHING APPARATUS.

IN the notice we gave of the launch of the *Oceanic* in our issue of last month mention was made of the special hydraulic launching apparatus that was used on that occasion; and, as we stated, we understood that Mr. P. Phorson, director and works manager of Messrs. J. L. Thompson & Sons, Limited, claimed to be the originator of the idea, we have now the opportunity of placing before our readers the matters upon which the claim was based, as we think credit should be given where it is due.

In 1892 Mr. Phorson was granted a patent No. 13401 for precisely the same device as used at Belfast, which we illustrate in the accompanying illustration.



It will be seen that the lying ways are strengthened with steel plates which pivotally carry a trigger.

The upper end of the trigger projects above the line of contact of the sliding and lying ways, and engages against a steel shoe which is fastened firmly to the sliding ways. The lower end of the trigger engages with the ram of a hydraulic cylinder fastened to the underside of the lying ways.

As soon as the vessel is ready to launch the ram is forced out by the hydraulic pressure in the cylinder, so that the trigger is maintained in the position shown, and is, therefore, capable of maintaining the vessel in position when the keel blocks have been knocked away. When everything is finally ready a cock or valve is opened, which allows the escape of the water from the cylinder, allowing the sliding ways in their movement to tilt the trigger into the dotted position, and permitting the steel shoe to pass quite clear of it.

It is stated that the great benefit to be derived is that this device allows the workman to be clear of the vessel before the final release is given.

We understand that the patent expired some time ago, and, therefore, the device is public property as far as this country is concerned.

R APPLIANCES AND MACHINE IVETTING IN SHIPBUILDING.

Developments at Belfast.

s it would have been impossible to have had the high am pressure and multi-expansion, the resulting economy anced speed at sea which now obtain without the power- chine tools for manipulating the huge plates of which ical boilers are made, and others which close the rivets the plates together; so it will now be impracticable, if possible, to go on increasing the dimensions and weight of viathan steamships without enlisting the aid of practically me kind of machine tools—but portable instead of sta- ry—for rivetting together the major part of the plates and of which the hulls of such ships are composed. Of course, power-tools in fixed situations employed for such operations ending, shearing, and punching plates and bars have long supplanted hand-work entirely, and to a considerable extent table rivetters now execute the rivetting work on frames and ors which was formerly done by hand. As regards rivetting e shell, decks, and bulkheads of ships, however, hand labour s still to be employed, owing to the work of binding the items gether having to be accomplished with each individual part *n situ*, and to the inapplicability hitherto of any machine-tool nvented for efficiently and conveniently rivetting the plating throughout an entire ship.

Various projects have been, from time to time, brought forward, showing rivetting machines at work on ships' shells, but their authors have generally overlooked the existence of scaffolding outside; hold beams, stringers and other obstacles, inside; and have too readily assumed that the steel-maker sends all his plates exactly in the order they are wanted from the garboard strake upwards! Such happy conditions of course do not exist in practice. Apart from these drawbacks, one other difficulty—held almost to be insuperable—has been that of devising a workable and efficient mechanical substitute for the manual duty known as "holding-up," viz., keeping the rivet-head hard pressed in place while the operation of pressing the point into place on the opposite side of the plating is proceeding. This, and the other difficulties indicated, have no doubt long stood in the way of the introduction of mechanical rivetting for ship's plating, and of the shell especially. It has, however, been recognised that if proper means of suspending and carrying machine-tools were once introduced the complete solution of the problem would not be very far off. The question as to whether such costly appliances as overhead cranes and lifting appliances would pay has slowly had to be solved, and venture after venture in this direction has now almost rendered the problem within measurable distance of complete solution.

There is of course another direction in which the solution of the machine rivetting of ship's shells can be, and to some extent has been, sought. That is by some radical alteration in structural methods, and especially the arrangement of plating. An obvious way of doing this is one which has been suggested over and over again, viz., to flange the plates inwards and rivet them up inside. This is of course only copying the old way of building cast-iron tanks; and although some vessels now-a-days do approach this form for a considerable part of their length, there still remains a large amount of more or less irregularly shaped plates, especially if the ends remain as now. Ships are subject to many cross stresses, and so many other points have to be considered that the fact remains that no vessel of any size has yet been thus built, except barges and such other craft for canal or river navigation. In 1877 Mr. James Humphreys proposed that the shell of ships should consist of longitudinal channel irons, and in connection therewith he incidentally showed on his drawings a complete shed, not only arranged to cover the whole ship during construction, but fitted up with hydraulic cranes and portable rivetters at work all over the vessel. Apart from the special form of construction the patent is worth perusal, and it was a great disappointment when, for reasons entirely unconnected with the hydraulic appliances, &c., the matter fell through.

While it remained a question as to whether such costly appliances as hydraulic overhead jib and travelling cranes, and the structures to carry them over vessels while under construction, justify the great expenditure in providing them, not very ards this end, but since large capacious steamships have become so much the vogue—in which stiffening features are largely dispensed with and extra weight put into the shell and side framing—enterprising builders have recognised that such appliances have become not only advisable as regards economy, but advisable, and necessary as well, on the score of efficiency.

Manual labour in rivetting, from its mobility, can be at once applied when wanted, and when not wanted can be dispensed with. From this fact arises one of the disadvantages of special and very costly appliances, which to justify themselves should be constantly in employment. This will no doubt continue to weigh with the larger number of shipbuilding firms, but on the part of those who undertake to build the heavier class of ships there can be no halting. The weights to be dealt with in the size and scantling of plates now in fashion, and the nature of the rivetting work which the binding of these plates entails, alike render heavy machine rivetters, as well as cranes, standards, and gantries, of some kind or other, imperative.

For a good many years now considerable attention has been given by not a few shipbuilders to cranes and lifting appliances, hydraulic and otherwise. Messrs. J. L. Thompson & Sons, of Sunderland, who adopted hydraulic machinery on an extensive scale so far back as 1883, have been especially ready to see the advantages of developing these features, and although not going the length of erecting covered-in sheds with travelling cranes, &c., they have very efficient provision of the kind. On the Clyde stationary hydraulic overhead jib-cranes have been used by Messrs. R. Napier & Sons, the Fairfield Co., and others for a considerable period. On the Tyne the conspicuous and elaborately-equipped covered-in sheds erected by Messrs. Swan & Hunter have now been in use for some time. To this firm and to the Newport News Shipbuilding Co. in the States—upon whose experience of a like feature, but of an essentially different design, Mr. Hunter based his own venture—much credit is due for so largely, and at such expense, leading the way in the matter of shipbuilding berth equipment.

Stationary derricks or hoists, placed at convenient points, each one capable of serving a certain part of the ship, so far as dealing with items for the ship's structure is concerned, have their advantages, but in several yards in the States these have been largely superseded by travelling cranes, of one form or another, capable of serving any and all points of one or more ships under construction. Typical examples of these cranes are found at the Newport News Shipyard, and at that of the Union Ironworks. At the former yard—as we gather from a paper by Prof. W. F. Durand read at the International Engineerin Congress held at Chicago in 1893—a narrow elevated permanen trestle work of staging runs back from the water front, a buildi slip being arranged close on either side. This staging carries track on which runs a double cantilever crane, similar in type that used as a yard crane, but without the motion of revoluti The overhang is sufficient on both sides to enable material to readily placed at any point on either ship. There are two s trestles and cranes at this yard, the larger having the follo principal dimensions: Length of trestle 740 ft., being suffi for a ship 650 ft. long, or, with slight addition, for one of 7 Length of traverse runway 178 ft., which gives sufficient br to span two ships 70 ft. beam. The travelling crane upo trestle is 95 ft. between the arm and the ground at the end of the ways. The gauge of the longitudinal rail about 20 ft. The capacity of the crane is 9,000 lbs. extreme end, increasing to 25,000 lbs. at a point 53 from the centre. The crane is operated entirely by motors.

For handling the structural material of a pair of s capacities of such cranes are ample, both as regards s lifting power. The only objection to this specialisatio hoisting and distributing function in one machine, and operated by one man, is that hoisting cannot be simultaneously at different points, but this disappears considered that, whether hoisting is done simulta seriatim, the machine has abundant capacity to keep gangs of men fully occupied. At the Union Iro staging consists of skeleton iron and steel structur on both sides and over a single building slip. Th members consist of upright and roof trusses, the braced and tied as to make a very strong and rig The ordinary ship staging is all carried from the while the roof trusses carry the rails for a pa travelling cranes which command every part of t construction beneath. The two cranes on each slip are complete in themselves and independent of each other in their operations. Each crane travels longitudinally the whole length of the slip, and commands one side of the ship, one of them, however, being 3 ft. longer than the other to command the centre or keel line. These cranes are of six tons capacity, and have a traversing speed of 150 ft. per minute. Another form of appliance, built by the same firm as those above mentioned, is in use at the works of the Cleveland Shipbuilding Company. This also is intended for one ship only, and consists of a pair of bridge-travelling cranes, supported at each end on a trestle work, built up on each side of the ship, each crane spanning the entire width.

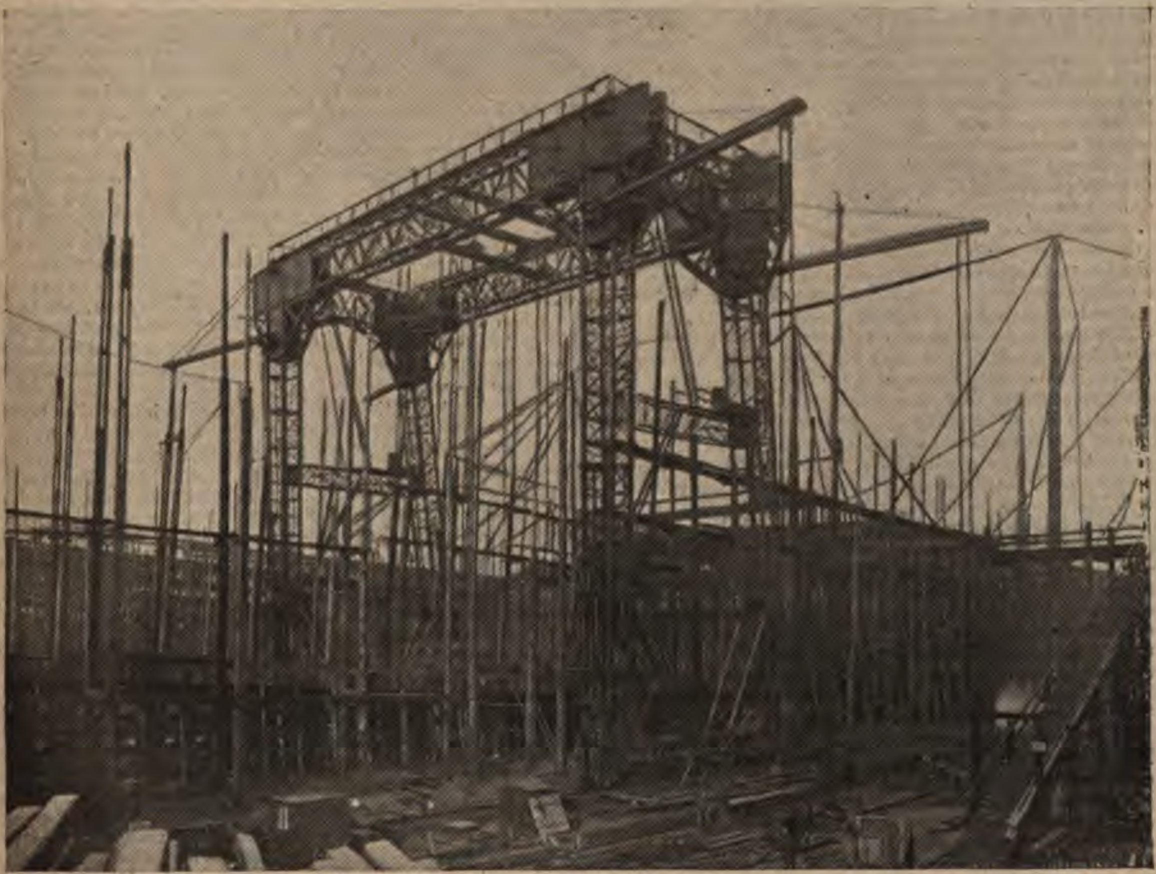


Fig. 1.—General View of Gantry in Messrs. Harland & Wolff's Shipyard.

The immense and elaborate covered in building shed at Messrs. Swan and Hunter's, it is generally understood, was undertaken in consequence of Mr. Hunter having satisfied himself, by personal inspection and otherwise, that the result obtained in the States justified such an outlay. The whole arrangement was most ably worked out by Mr. Hunter, assisted by Mr. F. Caws, of Sunderland, and while chiefly found of advantage as an aid to the handling of material required in the construction of vessels—for which purpose electric jib cranes of a somewhat similar type to those in the American yards referred to have been fitted—and as enabling work to proceed on a vessel irrespective of weather conditions, &c., it also justifies itself on the score of enabling hydraulic and other machine-tools to be held to their work all over the vessel.

The continued efforts of the shipbuilder in improving the mechanical equipment of shipyards, combined with the skill of the machine-tool makers, have thus—with other coincident advantages—brought the mechanical rivetting of ships' hulls much nearer complete solution. As the latest, and perhaps the fullest contribution to the development of mechanical appliances at shipbuilding berths, and incidentally to the solution of the old standing problem of the machine-rivetting of ship's plating, we must now refer to what has recently been done, and is still being enlarged upon by Messrs. Harland and Wolff, of Belfast.

Quite as interesting a feature, and greatly more conspicuous than the leviathan White Star liner *Oceanic*, as she rested on the stocks at Belfast just before launching, was the stupendous gantry spanning the hull of the huge vessel, with its jib and travelling cranes and other appurtenances. The importance of the part this mammoth appliance played in the construction of the great vessel will appear from what follows. Forming a species of arch over the ship, and mainly serving to carry hydraulic cranes, rivetting machines, electric drills, lamps, and rivet-heating furnaces, by its means not only was the handling of the heavy items of material of which the great vessel was built made a matter of ease and safety, but those items were for the most part rivetted together by hydraulic power, and many of the rivet holes were electrically drilled or hydraulically punched with the items exactly in place.

While it has features which resemble the appliance described as being in the Union Ironworks, U.S., the Belfast gantry is the largest in the world. It is propelled up and down the berth upon double rails, laid along each side upon massive concrete blocks, the entire length of the slip. The gantry is built throughout of steel, and consists of four vertical standards or legs, each pair of legs having a horizontal rider or cross girder. Lattice bracing is adopted throughout, and at the corners where the vertical and horizontal portions meet there are rigidly braced plate girders which render the whole structure strong and rigid. All the material entering into the structure was prepared and supplied by Messrs. Arroll Brothers, of Gormiston Ironworks, Glasgow. At each of the four corners a jib crane is fitted, by means of which portable rivetting and punching machines were suspended, and the material entering into the structure was handled. Each crane is capable of lifting a load of about four tons through a height of 80 ft., at a rake of 40 ft. All the motions—lifting, racking, slewing—are performed by hydraulic power. The cranes swing through an angle of 180 degrees, and can thus cover a space of about 80 ft. on each side of the centre line of ship. The hydraulic cylinders and valves for operating them are fixed to the four legs of the gantry near the ground line, and steel wire ropes pass over guide pulleys for controlling the several motions.

In addition to these four jib cranes, there are three hydraulic travelling cranes worked at the top of the gantry which traverse the full width of the gantry and thus embrace the vessel underneath. These cranes were mainly used for carrying portable rivetting machines which were suspended directly from hydraulic lifts hung from the carriages of the travelling cranes by flat steel links so arranged as to be easily put in or taken out according to the height at which the machines were being worked. Thus, after the rivetting up of the double bottom, and as the construction of the ship advanced, links were taken out and the machines brought to bear upon the deck and other parts higher up. The motion of the travelling cranes is controlled from the level at which the rivetting machines are worked by hand chains depending from sprocket wheels on the cranes.

The propulsion of the gantry as a whole is effected by hydraulic engines attached to the vertical legs of the gantry, actuating the wheels of same through suitable gearing. In order to ensure that both sides of the gantry shall always advance equally, the two sides are geared together by vertical and horizontal shafts carried up two of the legs and across one of the main top girders. The rails on which the gantry travels consist, on each side of the berth, of a pair of strong steel H section bars, having rivetted upon the upper surface flat steel bars, the whole bedded upon continuous blocks of concrete built upon close underground piling. The total length of the rails is about 650 ft., and the span of the gantry measures 100 ft. from centre to centre of each pair of double rails. The clear height from rail level to the under side of the cross girders of the gantry is 98 ft., and the clear space between the vertical legs is 95 ft.

Hydraulic pressure and return piping is carried up each of the four legs and across the top of the gantry, suitable branch pieces and hydrants being provided where necessary for coupling to rivetting machines, &c., in whatever positions they may be required. The pressure is taken from an hydraulic main laid alongside the berth, the connection being made by large flexible-armoured hose. The exhaust water is also returned to the pump station through suitable means, so that the same water is used over and over again.

On each side of the gantry, at different levels, are rivet-heating furnaces which enabled the rivetting machine to be easily supplied with rivets at any part of the shop. Amongst the rivetting machines used in the construction of the *Oceanic* were some having a gap of 7 ft., and capable of dealing with rivets 1¼ in. diameter. Another notable appliance was a portable hydraulic punch, capable of punching 1¼ holes in plates 1½ in. thick. These were used for punching the plates in the top strakes of the ship, the plates being fixed against others which had been previously punched, the portable machine using this as a template. Electric drilling or reaming afterwards insured the exact fairing of holes.

All the hydraulic appliances connected with the gantry were supplied and fitted by Messrs. Fielding & Platt of Gloucester. The gantry has been found to be an entire success, and no accident to life or limb has been met with, which is highly satisfactory considering the magnitude of the job and the difficulties met with when working at such a height and often in heavy weather. When the immense hull of the *Oceanic* had glided from underneath the gantry and had been safely brought to rest in the water, the gigantic proportions of this unique structure were even better realised. The thought in many minds doubtless was how can the enterprising builders of the *Oceanic* hope to take full value out of so special and mammoth a tool? On this score, however—as was even then felt—there need be no concern. The "powers that be" at Queen's Island Shipyard well know their business, and are fully alive to all that is ripe for adoption in the way of developing the art of shipbuilding. Another White Star liner, only 5 ft. shorter and 9 ft. broader, is about to be laid down on the stocks vacated by the *Oceanic*, and will be served by the *travelling* gantry and its equipment of hydraulic rivetters, punches, electric drills, lamps, heating furnaces, &c. Not only so, but the success which has attended the use of this first gantry has been such that another of the same design and size, but with cranes somewhat more powerful, is now being prepared by Messrs. Fielding & Platt, and will shortly be erected at Queen's Island Yard.

Referring now more particularly to the manner and the extent of the gantry's service in connection with the use of machine tools, it may at once be said that power rivetting, and probably power drilling and punching, were more fully and notably employed in the construction of the *Oceanic* than in any other vessel ever built in this country. Over 1,700,000 rivets altogether were used in building the vessel into one staunch structure. The number of plates going to form the shell of the vessel reached about 17,000, these varying from ¾ in. up to 1⅜ in. in thickness. The majority in the midship portion of the hull were as much as 29 ft. and 30 ft. in length by 4 ft. 6 in. to 5 ft. in breadth, and weighing from 2 tons to 3½ tons each. In some of the shell plates as many as 990 rivet holes had to be made.

The sheer strake and the strake next but one below it, in the *Oceanic*, are double plated; the intermediate strake not being so treated owing to its being pierced by the side ports. The upper deck stringers are also double plated. This construction is continued throughout two-thirds of the ship, and by it the top member—viewing the ship as a girder of the box description—is enormously stiffened both horizontally and vertically. The bilge plating is also doubled, and this, in conjunction with the bilge keels, completes the stiffening of the four corners of the girder. In order to get the full advantage of this system of doubling it was necessary that the rivetting should be of the strongest character, and the plates in close contact, so as to get the full effect of frictional resistance of the plate surfaces. The rivetting machines which were used for this work have already been referred to, and it may be added that they are, we believe, of larger size than any before employed for like operations—some being 7 ft. in the gap—though of course equally large machines have been used in stationary situations, or where portability was not a feature.

All rivet holes in the vessel's upper works intended to be fitted with machine-closed rivets were drilled true in position by means of electric drills, one of the thicknesses of plating having been previously punched, thus serving as a template. The rivets in this region were finished off at the point with a snap head, and careful attention was paid to symmetry in the arrangement. As completed, these rivets, far from being unsightly, stud the topsides of the great ship much to their æsthetic as well as their constructional advantage. As has been truthfully said, these rivet heads are "the *ne plus ultra* of this kind of work, and are to the trained eye so many beauty spots." These rivets were 1¼ in. diameter, and over 72,000 of them were closed by the hydraulic machines.

All the rivets were of steel, and were of course more difficult to close than iron rivets. Some of them—notably those in the keel attachment—were no less than 7 in. long, 1¼ in. diameter, and weighed as much as 3½ lbs. The flat keel bar was attached by four rows of these rivets crosswise, being countersunk on the outside and snap pointed inside. The upper deck stringer angle bars have 8½ in. width of flange, 1 in. thick, and the stringer plate was doubled as well as the sheer strake. There were thus three-ply involved, and some of the rivets here were 6 in. to 6½ in. long, where thicknesses overlapped. No wonder that rivetting power greater than the brawniest arms could wield was required on the *Oceanic!* The keel and the topside rivets especially could not, in truth, have been closed by hand; at all events as a practical operation.

The work done by the hydraulic machine tools on the *Oceanic* was certainly splendid, and the whole arrangements made by the builders for enabling advantage to be taken of their Titanic services reflect the utmost credit on their skill and enterprise. Both builders and machine tool-makers in this undertaking, and in the similar one under way, have very materially advanced the cause of power rivetting for departments of shipbuilding work which have hitherto only seen but partial development.

The Reeves Patent Filters Company, Limited, inform us that they have removed their offices to 9 and 11, Fenchurch Avenue, London, E.C.

NAVAL MATTERS—PAST AND PROSPECTIVE.

(From our own Correspondents at home and abroad.)

The Naval Estimates.

WITHIN a week or so we shall once more hear Mr. Goschen's statement of what he proposes to do with the money which is voted annually by Parliament for the purpose of maintaining the strength and efficiency of the Queen's Navy. We shall also know what amount of money is to be spent, whether it is to be an increase or a decrease on that voted last year. Very little information has been vouchsafed by the statement in the Queen's Speech that "the estimates for the service of the ensuing year have been framed with the utmost economy that the circumstances of the present time permit." There is in the latter part of this sentence a sort of challenge to foreign governments to spend as much money as they like on naval armaments, but an insinuation that this country will spend more. Of course, Mr. Goschen will propose that new warships be commenced, but it will be practically impossible to proceed at once with their building unless the supply of material is greatly increased. The armour-plate and gun makers have as many orders as they can conveniently attend to, and as a matter of fact many of the ships which are now being built in the various public and private yards have been delayed on account of the slow delivery of armour and armament. There are at present about fifty vessels under construcfion, among which may be counted sixteen battleships and twenty-seven cruisers, and some of the vessels proposed to be commenced by Mr. Goschen in last year's supplemental programme have not yet been laid down. This means that more money will have to be voted this year than on any previous occasion, for if new vessels are to be laid down work on the vessels in hand at present will have to be expedited and a great deal of extra labour employed for the purpose, and then, as fast as these ships are prepared for sea officers and men are required to man them, and consequently greater quantities of food, clothing and stores generally will be required, But whatever sum Mr. Goschen asks for ought to be given to him by Parliament without any needless discussion and argument, for he is not in the habit of asking for unnecessary money.

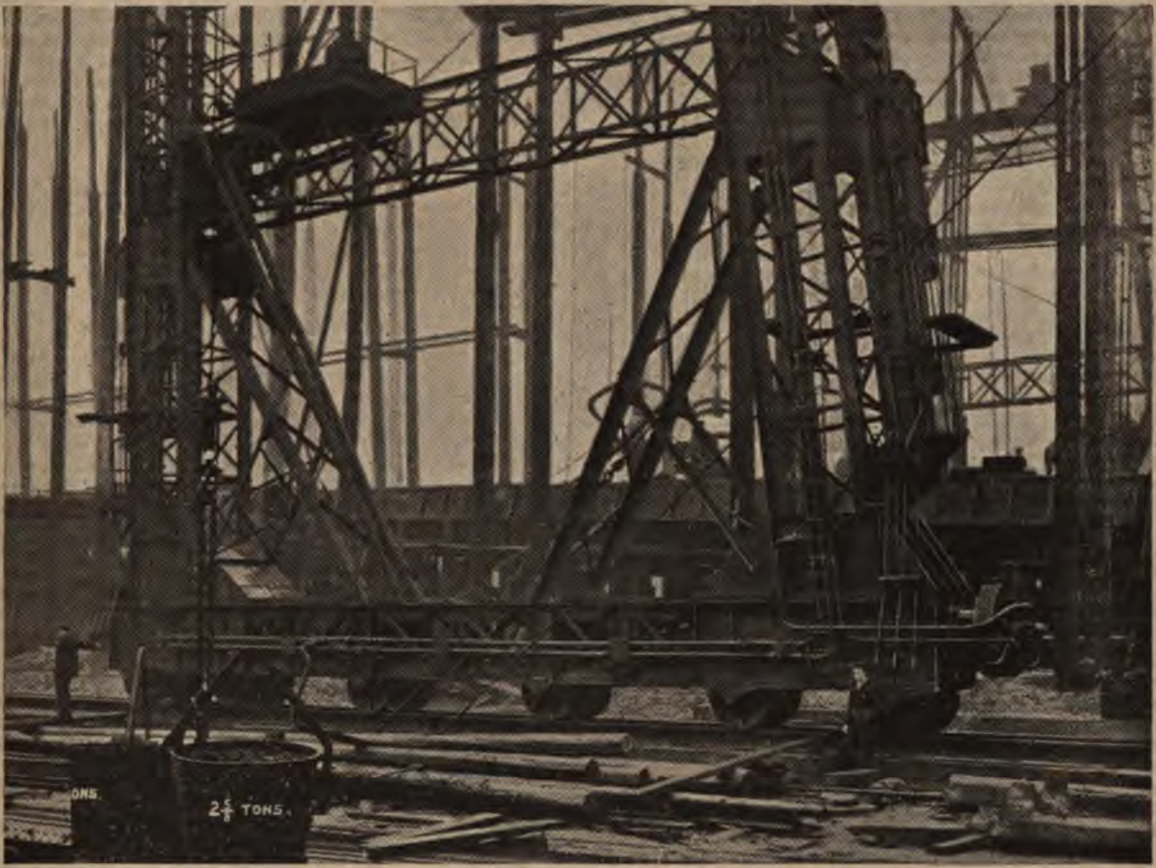


FIG. 2.—VIEW SHOWING BASE OF GANTRY, LIFT CYLINDERS, AND ENGINE. (*See page* 494.)

The Navy and the Recent Storms.

The very rough weather which was experienced a week or so since all round the United Kingdom has had its effect upon the ships of the Navy equally as upon our merchant vessels, although fortunately, no very serious damage has been done. The *Edgar*, apparently, has suffered most, for she arrived at Plymouth recently minus one of her funnels, and generally knocked about. It appears that when off Cape Finisterre very heavy weather was experienced, and huge waves broke over the vessel, one of them tearing the funnel from its socket. First of all the guys gave way, followed by other stays and bolts being wrenched out, and shortly afterwards the tottering funnel was struck by a wave, and lifted bodily over the ship's side into the sea. It weighed about ten tons, but, fortunately, did little harm in falling, except to smash a boat and damage some deck fittings. The vessel proved herself possessed of splendid sea-going qualities, and some very skilful seamanship must have been necessary to have brought her safely to port. Admiral Fremantle visited the vessel soon after her arrival. She is to be fitted with a new funnel at once, and is to leave with relief crews for the *Royal Oak* in the Mediterranean. Other vessels have also felt the severity of the weather. The coal consumption trial of the *Gladiator* had to be shortened by two hours, and the steam trials of the cruiser, *Psyche*, had to be postponed. The Training Squadron, too, was obliged to return to its anchorage at Berehaven early last month, as on getting out of the Bay the weather looked so bad that it was not deemed advisable to sail just then.

A United States Squadron for England.

There is a very general belief at Portsmouth that a squadron of United States warships will visit that place in a few months time. The squadron will probably consist of a battleship and a couple of cruisers. One of the latter, according to a statement said to have been made by the Secretary of the United States Navy, will be the *Brooklyn*, which is now stationed at Havana, and which, it will be remembered, visited this country a couple of years ago on the occasion of the great Jubilee review at Spithead. The *Newark* will probably be the other cruiser, and a wish has been expressed in many quarters in this country to see the battleship *Oregon*, the vessel which steamed from San Francisco to Key West without a mishap, but whether this wish will be gratified it is impossible to say, but it will all depend upon what vessels can be spared, for the United States Navy department has at present a great many calls for warships to guard her interests in different parts of the world and patrol the waters of her newly-won colonies. In any case a hearty welcome awaits the American officers and men. The squadron will probably call at Torquay, and preparations are already under way by the Portsmouth officials to extend the national hospitality to the American officers and seamen at that port.

Some Complaints about Keyham College.

There have appeared in the Press lately a number of complaints from the parents of students at the Royal Naval Engineering College, Keyham, as to the food and general conduct of this establishment. As regards the former, it is said to be unsubstantial and not of the best quality. One parent complains that after the midday meal the only food given to the students is some weak tea and bread and butter, and of the latter article, says the writer, great complaints are made. At nine o'clock in the evening each student is given a bun. As a sort of remedy to this state of affairs the writer suggests that the engineer officer on duty should take his meals at the students' tables, and have no settled place, otherwise, says he, the messmen would take good care that special fare would be placed before him. It has also been suggested that Keyham should be placed under the control of a senior engineer officer, instead of, as at present, a naval commander. The staff of the college consists partly of civilians and partly of engineer officers, an arrangement which also causes some dissatisfaction. The establishment ought to be quite as well conducted as the *Britannia*, and if all that is said of the college is true, it is a wonder that it is so successful.

The Health of the Navy.

The annual return dealing with the health of the Navy for 1897 has recently been issued, after being in the printers' hands for something like six months. Altogether the returns may be described as very satisfactory, and the improvement in the health of the officers and men of the Royal Navy, which has been noticeable for many years past, continues. The aggregate number of cases of disease and injury for 1897 shows a ratio of 894·81 per thousand, a decrease of 16·26 compared with the previous year, and of 71·32 per thousand on the average for the last ten years. The ratio this year is the lowest obtained since the reports were first issued in their present form thirty-three years since. The operations against the King of Benin are accountable for thirty-three cases of wounds in action, eight of which proved fatal, and four cases of yellow fever are reported from the North American and West Indian Station, resulting in one invaliding and three deaths. Enteric fever on the Mediterranean Station also showed a slight increase, but this increase is chiefly due to an outbreak which occurred on board the *Forte* at Phalerum Bay. The total number of cases of disease and injury was 72,068, out of a total force for the year of 80,540 officers and men. The average number of men sick daily was 3,062·41, a decrease of 1·06 per thousend compared with the previous twelve months. The number of days' sickness on board ship and in hospital in the total force was 1,117,782, an average loss of service from disease and injury of 13·87 days for each person. 422 deaths were reported, The lowest sick rate was on the south-east coast of America Station, and the highest on the China Station. There were nineteen cases of smallpox, of which eighteen were contracted at Canea, It was supposed that this disease was brought into the ships in the clothing of the landing parties. There is a great increase of fever in the Mediterranean, the majority of the cases occurring while the ships were stationed at Malta. A considerable amount of fever, too, has occured on vessels employed on African rivers. However, it is good to be told that the health of Her Majesty's Navy increases year by year, and it is to be hoped that the improvement will continue.

Prize-Firing in the Navy.

The annual government return on prize-firing in the Navy for 1896-7 has been issued. A glance at the contents shows that during this period hardly £1,163 was distributed in prizes throughout the whole of the Navy, a very small sum indeed compared with the number of men there are among whom this sum had to be shared. £909 was awarded to petty officers and seamen of the Navy and the remainder to the marines, £127 15s. to non-commissioned officers and gunners of the Royal Marine Artillery, and £125 10s. to the non-commissioned officers and men of the Royal Marine Light Infantry. Thus it will be seen that the guns crews of the Navy carried off more than three-quarters of the money, or to be precise, 78·21 per cent., the Marine Artillery 11 per cent., and the Marine Light Infantry 10·79 per cent. 1.828 naval guns crews competed, 225 guns crews of the Royal Marine Artillery, and 338 crews of the Marine Light Infantry. £395 16s. was won by the firing of the machine guns, and £327 by the 6-in. gun section. The smallness of the sum distributed will be seen when it is stated that it has to be shared amongst nearly 37,000 men. Although the gunnery of the Navy does not reach such a high standard as could be wished for, there is little doubt that our record in this direction is considerably in front of that of foreign powers, and an increase in the money awarded for prizes would doubtless considerably improve the shooting of British gunners.

Work at Haulbowline Dockyard.

In an evening contemporary recently there appeard a letter from a correspondent in which he declared that the total neglect of Ireland in regard to the Navy was part of an apparently general and settled policy. His chief point seemed to be that Ireland did not receive her proper share of naval work compared with the money which the Imperial Treasury received from that country every year, but reports from Haulbowline Dockyard, the only government dockyard in Ireland, would indicate that at that place there is plenty of work for all engaged there. According to a correspondent of the *Globe* work there is progressing very briskly, and some 500 hands are daily employed there. The total cost of the works now being carried out is considerably over £60,000, which is, however, some little in excess of the original estimate. The coaling wharf is one of the items that have been entrusted to a contractor, and it is actually under way. It will cost £17,000, which is more than the Admiralty bargained for. There is a fleet-engineer appointed to the yard, Mr. Gilbert, and judging from the amount of machinery at Haulbowline, his berth will be no sinecure. The torpedo-boat slip is finished, and the machinery for hauling up the torpedo-boats is now being placed in position. The electric light machinery is also in a state of forwardness. This report takes the edge off the grievance of the writer mentioned above, and it is only because there are no private shipbuilders in Ireland willing to tender for government work that more government money does not find its way into the pockets of Irish workmen and their employers. As probable result of the letter in question the Secretary of the Admiralty was asked in Parliament whether he could arrange for more work to be given to Haulbowline. He replied that the work carried out at that yard had been considerably extended of late, and if the necessities of the Service required it the capacity of the yard would be fully considered, a somewhat oracular statement, it must be admitted, and capable of very free translation.

Some Interesting Cruiser Trials

During the past month some most interesting cruiser trials have taken place, and out of them all the *Niobe* appears to have made the only really unsuccessful trial. Highly satisfactory as were the results obtained at the Contractor's trials, the subsequent tests she has been put to have not shown her in the best light. In the second week of last month she left Plymouth for further trials, including a 60-hours' coal-consumption trial. Two days later the starboard high-pressure cylinder gave out, necessitating her being taken to Spithead for repairs. She is to be subjectedto a further series of trials before she joins the Channel Squadron. The trials of the *Ariadne* appear to have been a complete success. On her 30-hours' coal-consumption trial at one-fifth power a speed of 13·3 knots was obtained with 3,758 I.H.P., and a coal consumption of 2·05 per I.H.P. per hour. On a second 30-hours' trial at four-fifths power a speed of 20·1 knots was obtained, the I.H.P. being 14·046, and the coal consumption 1·73 lb. per I.H.P. per hour. At a final 8 hours' full-power trial the speed attained was 21·5 knots, the I.H.P. being 19,156, with a coal consumption of 1·66 lb. per I.H.P. per hour. The trials of the *Gladiator* were also entirely successful. At a 30-hours' trial at one-fifth power a mean speed of 11·8 knots was obtained with 2,164 I.H.P., the coal consumption being 2·16 lb. per I.H.P. per hour. At a 30-hours' trial at three-fifths power a speed of 17·5 knots was obtained, with 7,149 I.H.P., the coal consumption working out at 1·99 lb. per I.H.P. per hour. The results obtained by both the *Ariadne* and *Gladiator* reflect great credit on the firms who are responsible for the machinery, for in both cases were the Admiralty requirements exceeded. The *Psyche* has also undergone some successful trials, and at one of 30 hours' duration a speed of 17 knots was obtained with her engines working at only half their power. The *Pomone*, too, had a 30-hours' coal-consumption trial, which was successful in every way. The *Pegasus* has undergone several unsuccessful commissioning trials, and, as a result, a court of inquiry assembled at Chatham dockyard to investigate the causes of these failures.

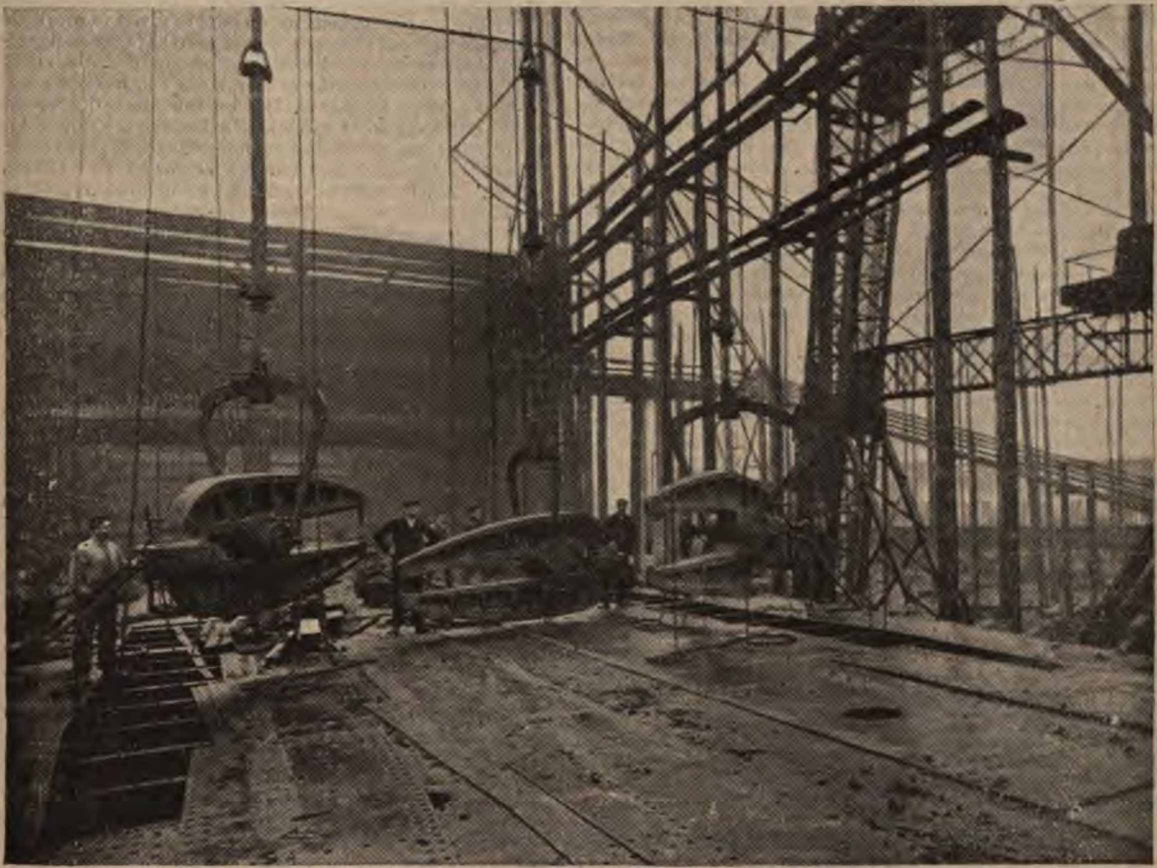


Fig. 3.—"Fielding" Hydraulic Rivetters and Suspension Gear and Lifts. (*See page* 494.)

Chatham Dockyard.

Excellent progress is being made here in the construction of the new battleship *Venerable*, laid down in January last, and, considering the time she has been on the building slip, she is in most advanced condition. Her launch has been nominally fixed for June next, and every effort will be made to have her ready by that time. The other ship building at this yard, the cruiser *Pioneer*, is now almost ready for launching. Her machinery has now been placed on board, and when she takes the water she will be in a more advanced state of construction than was her sister ship, the *Pomona*, when launched. The *Irresistible*, although still in a very unfinished condition, is receiving a good deal of attention, and most of her boilers and engines are now in place. The wonderfully successful trials of the cruiser *Ariadne* was the cause of not a little enthusiasm among the contractors' representatives before these gentlemen left the yard. She more than fulfilled the Admiralty requirements, despite the fact that she carried out the trial under most unfavourable conditions of weather. Work on the new naval barracks here is being hurried forward as much as possible. According to the contract, the building is to be finished by 1901. It will be of red brick with stone dressings, and will cost nearly £400,000 to complete. Some land near by was recently purchased by the authorities at Whitehall on which it is proposed to build a new gunnery school. The machinery and gunnery trials of the Goliath have been postponed owing to some of the vessel's armour plates not being delivered at the specified time. These trials were to have taken place some time this month.

The Death of the Thrasher Hero.

Stoker Edward Lynch, who, it will be remembered, risked his life to save another stoker when the torpedo-boat destroyer *Thrasher* ran ashore near Falmouth in September, 1897, died at his home in Ireland a few weeks ago. He was sent from the Royal Naval Hospital, Stonehouse, to his home in December last, after lying ill for some months. When he left the hospital at Stonehouse he was granted six months' sick leave by the Admiralty, so that he actually died in the service, and had not been invalided out of it as has been reported. Immediately after his death his mother received a communication from the Secretary of the Admiralty expressing their Lordships' sincere sympathy, and informing her that Stoker Lynch's heroism would not be forgotten by the authorities. Lynch received the Albert medal of the first class at Devonport in January of last year, Admiral the Hon. Sir E. R. Fremantle personally conferring the decoration in the name of the Queen. Every available coastguardsman from Youghal and the surrounding stations turned out on the occasion of the funeral, in order that Lynch should be buried with naval honours. The men were under the command of Lieut. Dillon, and were in full uniform. It is probable that a memorial will be raised to the memory of Lynch, and also a cabin endowed in the Sailors' Home, Portsmouth. Money is now being obtained for this purpose.

Portsmouth Dockyard.

The usual routine of work at this yard has been carried out during the past month with little interruption. Orders were recently received from the Admiralty directing that all refitting and repairing work should be hurried on, but this was not the cause of any overtime being worked. The *Scout* has arrived here, and has been sent to the Dockyard Reserve, aftter serving four consecutive commissions abroad. She will need considerable attention, but will probably not be taken in hand until the commencement of the new financial year. The Admiralty yacht *Enchantress* is undergoing her annual refit, which will be completed at the end of this month. The Royal yacht *Victoria and Albert* has also been placed in dock to undergo an overhaul before she conveys the Queen across the Channel on the 9th of this month. The surveying ship *Research* too, is in hand, and the repairs on her are to be completed by the end of this month, as early next month she will once more resume her work. An effort will be made to have the *Andromeda* completed by the end of this month. A serious accident, which was attended with fatal results, happened here early in the month. A labourer working on the cruiser *Sybille* was removing chips from the after magazine when the basket he was carrying caught the clip of the hatchway grating and unshipped it, with the result that the iron fell upon his head and broke his neck. Another occurrence here, attended with fatal results, was the firing of a cargb of about 2,000 tons of coal. The outbreak was discovered on Sunday morning, and the naval store officer, Mr. W. Hynes, was immediately informed of it. Apparently the excitement was too much for him, for, before reaching the spot, he became faint, and died before reaching his home. The coal was still burning on the following Monday, and the entire stock had to be removed before it was completely put out. The effects of the recent rough weather were felt at this port, and the port guard-ship, *Trafalgar*, during the gale on the 12th ult., drifted from her moorings, but was luckily pulled up by her anchors before she had gone far. It may be interesting to mention that before the *Resistance* left for Liverpool to be broken up her armour was stripped off for the purpose of making proof butts at Whale Island. Work on the *Rodney* has been postponed until April, instead of being carried out at once, as was at first thought would be done.

Naval Construction in France and Russia.

In a recent issue of the *Times* there appeared a lengthy article on the naval construction of France and Russia during the past year, and the naval estimates on these countries for the present year. From this one learns that France and Russia have seventeen battleships in hand and twenty-three first-class cruisers building or ordered. Numerically, of course, our rivals have the better of us, but, as a matter of fact, none of these cruisers are so powerful as the vessels we are building or have ordered. The French programme for 1899, which, however, has not yet received Parliamentary sanction, includes 108 vessels of all classes, of which nearly a score are almost ready for sea, and have undergone their steam trials. More than £1,000,000 is being spent by France on re-boilering and re-arming the older battleships and coast-defence vessels, and great activity is being displayed in the construction of first-class armoured cruisers, twelve of which are to be completed during the present year. Four smaller cruisers are building and two projected, and twelve destroyers, eleven sea-going torpedo-boats, thirty first-class torpedo-boats are to be taken in hand and completed as rapidly as possible. As regards Russia, the *Times* states that during the seven years commencing 1898 her naval enditure will be about £51,000,000. With this money have constructed eight battleships, an armoured cruiser, six first-class protected cruisers, ten other cruisers of 3,000 tons each, a torpedo transport, twenty destroyers, and thirty torpedo-boats. Several of these ships are to be built in Germany, France, and the United States, but only one, a destroyer, in this country by Messrs. Laird, of Birkenhead. Russia has altogether ten battleships in hand, two of which have been launched, one is now on the building slip, and the remainder have been ordered or projected. Eleven first-class cruisers are also under construction, with displacements ranging from 6,500 tons up to 12,500 tons. Altogether great activity is being shown by both countries, and the article from which these facts are taken will cause additional interest to be taken in the coming Navy Estimates.

Pembroke Dockyard.

It has at last been decided that the new royal yacht is to be launched on May 9th next. Her Royal Highness the Duchess of York has promised to give the new vessel her name, and every preparation is being made here to give the royal visitors a fitting reception. The new vessel is to have as a figure-head a shield bearing the royal arms, and on top of this a crown three feet high. One quarter of her stern will be decorated with a 10-ft. figure of Britannia, and on the other quarter will be a figure of Neptune. A large shield bearing the Royal Arms will be placed between these two figures, and, beneath this will be carved representations of the rose, shamrock and thistle, richly gilded. Her hull will be encircled by mouldings representing two 15-in. cable-laid ropes. These mouldings will be carved out of solid mahogany and gilded. On the occasion of the launch her Royal Highness is to be presented with an ivory model of the yacht, which is now being carved here. Preparations are being actively carried on for the commencement of the new armoured cruiser which is to be built here. Overtime is being resorted to to hasten the completion of the *Spartiate*, which was launched in October last.

Increasing the Speed of Destroyers.

The marvellous speed which has been attained in late years by torpedo-boat destroyers promises to be still further increased when the vessels which have been ordered by the Admiralty from Newcastle-on-Tyne take the water. The vessels are to be built by Messrs. Parsons, who, it will be remembered, have been experimenting with turbine-driven vessels for the past three years, and will probably have a speed of thirty-five knots. At any rate, this is the speed which the builders reckon on obtaining, and is warranted by the improvements which they claim to have made in their system of turbine propulsion since the *Turbinia* has been afloat. One difficulty which has been overcome is that in connection with the speed of the vessel when going astern, and this improvement has considerably added to the manœuvring capabilities of turbine-driven craft. Only two vessels are to be undertaken by Messrs. Parsons, and each of these will have six turbines and four propeller shafts combined in a novel way, four only of the turbines being used when steaming ahead and two for going astern. When the vessel is steaming forward four turbines and all the shafts will be used, but when she is required to go astern the other two turbines will be coupled to two of the propeller shafts and steam will be admitted into them. The highest speed obtained up to the present time by any of our destroyers has been considerably short of thirty-five knots, although the *Express* is receiving machinery at Birkenhead, from which it is calculated she will obtain a speed of thirty-three knots.

Devonport Dockyard.

One of the chief events at this yard during the past few weeks was the arrival here of the *Edgar* with one of her funnels missing. Considerable pride was taken in her performance off Cape Finisterre, as she was the first modern cruiser built at this yard. Trouble is still being experienced with the *Niobe's* machinery, although, curiously enough, no trouble was experienced with her while she was in the contractors' hands. It is impossible to say what will be the next misfortune to happen to her. When the *Implacable* is launched on the 11th of this month she will have been on the slips eight months all but four days. Nothing has happened to impede her progress since the day when her keel was laid. It may be mentioned, however, that it was only with the greatest difficulty that work could be proceeded with on her during the recent rough weather, and the same may be said of the battleship *Bulwark* which is in preparation. As regards repairs and refits, the *Hecate* has been placed in the Dockyard Reserve, and is to be refitted and reboilered preparatory to a further period of service. The *Blake* is also to have her machinery attended to, and repairs on her will be completed, if possible, by the end of this month, and every effort will be made to complete the refit of the *Calypso* and *Temeraire* by the same time. The *Sheldrake* has been commissioned here, and is to be used for experimental trials and instructional purposes. She is fitted with the Babcock and Wilcox type of water-tube boilers, and is to be lent in turn to the depots at Devonport, Portsmouth, and Chatham, so that the engine-room artificers and stokers at those places may become acquainted with the working of this type of boiler.

Natal Coal and the Navy.

In a report issued by the Commission appointed by the Government of Natal to inquire into the coal industry of the colony it is stated that Natal now has a coal mining area comprising 1,350 square miles, and an available estimated deposit of 2,073,000,000 tons. The colony now contributes 12,000 tons of coal free every year to vessels of the Imperial Navy calling at Durban, and the Commission recommends that between 5,000 and 10,000 tons of coal be permanently kept in stock at that port, and also the abolition of light dues and port dues in the case of vessels calling to coal. 700 ft. of extra wharfage have been authorised by the Natal Government, in order to make the port a coaling station expressly adapted for an export trade. Another suggestion is for a system of export from Natal by means of regular colliers, and that in the case of coal bona fide exported from the colony or taken into ship's bunkers at the outer anchorage, a rebate of 23½ per cent. upon railway rates should be granted, while all steamers entering the port for bunker coal should be relieved of port dues. These suggestions are made by the Commission with the object of making the port the cheapest coaling station in the Indian Ocean, and increasing the export coal trade.

Sheerness Dockyard.

Considerable interest was evinced at this yard at the trials of the *Perseus* and *Pomona*, especially as regards the latter vessel, which is fitted with the Blechynden type of water-tube boilers. Although the *Perseus* was obliged to abandon her first forced-draught trial owing to a tube bursting, it was hoped that as soon as this damage was made good she would carry out the trial successfully. The construction of the new sloops, *Vestal* and *Sheerwater*, was commenced about three weeks ago, and would have commenced earlier if an accident had not happened to some of the material to be used on them. These sloops will be practically of the same type as the *Condor* and the *Rosario*. The engines and boilers of the *Rosario*, it may be mentioned, which are being made in Keyham Factory, are almost finished. The *Condor's* machinery is being built by the Thames Shipbuilding Company, as is the machinery of the *Sheerwater*. The new vessels are to have a horse-power of 1,100 with natural draught and 1,400 with forced draught, which is to give them a speed of 12·6 knots and 13·5 knots respectively, and when ready for sea they are to be sent on service abroad. Their armament is to consist of six 4 in. quick-firers and four 3-pounder quick-firers. The end of the present year will probably witness their floating out.

Colours for Warships.

A most excellent and patriotic suggestion has been put forward by a correspondent of the *Daily Graphic*, to the effect that every ship in the Navy should have a battle-honour flag, in the same way that regiments have colours with the names of the chief battles in which they have taken part emblazoned on them. Of course, in some cases, warships have painted along the break of the poop round the barbettes, or on the steering wheel, the names of victories in which ships of the same name have taken part, but no ship has a flag bearing such a record. The *Daily Graphic* correspondent suggests that the flag might be something after the style of a regimental flag, adorned with crest or badge of the ship (as often borne on her bows), encircled with a wreath of oak leaves and acorns, and surmounted by the crown, while the principal engagements in which the vessels bearing the same name have taken part are set forth in a surrounding scroll. The "Jack" would be relegated to the canton next the staff. The ground of the rest of the flag might be white, and when in any future engagement a ship specially distinguishes herself above her fellows, this might be changed to scarlet or crimson, as a special mark of distinction. The staff might be surmounted by a gilt trident, on which should he hung a conventional laurel wreath, as a suggestion for a universal pattern symbolising the command of the sea, and the laurels which our navy has won in fighting for it. To carry out this idea properly a special badge would have to be officially granted to every ship, and an official list of war honours settled for each vessel claiming any. Such a system, says he, would cost little, raise the spirit of hearty emulation even higher, if possible, than it is at present, and perhaps might lead the general public to pay a little more attention to our glorious naval history than it is inclined to do at present. He also suggests that the Admiralty names all new warships after the names of counties and towns, and that the municipality after which the ship is named should be presented with a picture of the vessel to be hung in their council chamber. This is certainly a better idea than that of giving warships such names as *Terrific*, *Enormous*, &c., and would tend to increase puplic interest in the Navy.

ELECTRICAL NOTES.

(*From our own Correspondent.*)

THE trials of the *Holland* have struck the fancy of the French, and glowing reports have come over of what is to be expected from the *Gustave Zede*. This submarine boat has undergone several trials with apparently some success, and these slight successes have been hailed by the emotional Frenchmen as an indication that they will soon easily be equal to the English Navy. The *Holland* is 53 ft. in length, 10 ft. 3 in. in width, and the *Gustave Zede* has a length over 131 ft., and proportionally wider than the *Holland*. They are both of the cigar shape, built of steel, and capable of withstanding a heavy external pressure. The *Gustave Zede* is submerged by means of rudders, the *Holland* by admitting water to tanks. Both are driven by electricity when submerged, stored in batteries which serve as ballast; but when travelling along the surface a gasoline engine is used for the *Holland* boat. The *Gustave Zede* makes ten knots an hour, the *Holland* between eight and nine. Both are equipped with a strong electric light and reflector, to be used when submerged. The reflector consists of rims of prismatic glass resembling the optical apparatus made use of in lighthouse lanterns. The advantages of submarine boats have not been seen by the English Admiralty as yet, the subject being purely in the experimental stage.

The Argonaut, the invention of Mr. Simon Lake, is another. This vessel can crawl along the bottom of the ocean as well as swim on its surface and under it. It has travelled 1,500 miles during the past year, in all sorts of weather whilst cruising on the surface, and over all kinds of bottom when submerged. The *Electrical Review, N.Y.*, says she has proved herself to be seaworthy, habitable and navigable when submerged. It has been found most difficult to navigate between the surface and the bottom, because to do so a perfect equilibrium and trim must be maintained, and these submarine currents affect the course of the submerged vessel, and the wave motion tends to destroy both trim and equilibrium. The *Argonaut* is designed to travel on the surface and the bottom, and for the latter driving wheels are provided and a third wheel which serves as a rudder. It has travelled over bottom so soft that the divers, when leaving the boat, would sink nearly up to their waist in mud, yet she was so nearly buoyant that the wheels did not bury over six inches She has, says the *Electrical Review*, "run up and down steep hills and across dredged channels. She can climb over any obstructions she can get her nose over, owing to the fact that she is so very buoyant." Submarine boats cannot use power which will give indications of their presence in war time, and so storage batteries must be used. There are four compartments in the *Argonaut*. First: the living room, in which are the engine and all machinery. Second: the diver's room, with a door opening outward in the bottom, an air-lock and a forward compartment and look-out forming the third and fourth compartments. The machinery consists of an engine, a 3 k w dynamo for lighting the interior, and also to run the 4000 c. p. searchlight placed in the extreme bow, a power and hand-compressor for charging the compressed air reservoir and to the divers, power and hand-water ballast pumps, and power and hand-hoisting apparatus for lifting the two heavy down laid weights of anchors. The *Argonaut* may be applied to other than war purposes, it may be utilised for the recovery of cargoes from sunken vessels, pearl and sponge fishing, laying of sub-marine foundation. The *Electrical Review* also deals with the French sub-marine boats.

There is an excellent article in the *Electrical Review* on the application of the electric motor to warships. It points out that in a warship there are 30 or 40 auxiliary machines which might be adapted to be driven by electricity. These machines comprise capstan engines, boat hoists, winches, ventilating fans, air compressors for torpedoes, dynamos, steering engines, ash hoists, latter engines, and the gun-working machinery. These are now all worked by steam direct, except the gun-working machinery, which is almost always controlled by hydraulic power. Then it goes on to point out there are four competitors—steam direct, hydraulics, electricity, and compressed air. For heavy gun-working machinery there are—

1. A very powerful and perfectly-controlled turning engine for swiftly revolving the gun platform or turret.
2. An engine for working the guns and slides in a vertical plane.
3. A means for running the guns out after discharge.
4. A rammer for loading.
5. A hoist for lifting ammunition from the magazine below, and some smaller engines of less importance.

Electrical appliances have been proved to be far in advance of steam. There is no danger from burst pipes; the heat imparted to compartments and the difficulty of regulation renders its employment often impossible. Compressed air, says the *Review*, is visionary as a motive power. Electricity is better than hydraulic force, since its freedom from failure, its capacity for regulated motion. It is noiseless, the space often less, an armour-clad motor would resist the effects of splinters efficiently. There is insufficient data from which to draw conclusions as to economy.

Every properly-equipped passenger steamer now carries its electrical engineer, and to those the article in the *Electrical Review* on the Electrical Engineer will be of interest. The engineer of to-day, it thinks, will be inconvenienced if he does not know electrical science. Professor Perry used to talk of electrical engineering as not being engineering at all, but simply electric plumbing, and that even he who would be a proper electric engineer must first be mainly a mechanical one. But the great engineers, Fairbairn, Rennie, and Smeaton, were men of all-round attainments, and an engineer was supposed to do anything. Now it has all gone to specialism.

But take an electrical engineer who is to utilise water power. He must be intimately acquainted with practical hydraulics, with the rainfall for the district, the area of the water shed; its geology. He should know the principles of construction of water-wheels, and especially turbines. We do not agree that the engineers of the largest and most successful undertakings will depend upon the chief draughtsmen of the manufacturing contractor. No; the great engineer will know all that the chief draughtsman knows much better than he. And it is just because they know the success or failure of all the details that they are successful and great.

The Japanese are very forward in electric enterprises, and a large number of the villages have been connected of recent years. Thus, last year, the submarine cable between Japan and Formosa was laid—a distance of 868 knots—which was laid by the cable steamer, *Okinowa Maru*. It has a seven-strand copper core, weighing 130 lb. per knot, and there is another cable projected. Telephone services have been quite as much extended. Exchanges exist at Tokio, Osaka, Kobe, Yokohama, and Kioto, and soon they will be at Nagoya and Bakau. There is a long line, says the *Electrician*, of 376 miles between Tokio and Kobe, which has a complete metallic circuit. Old Gower-Bell instruments have been replaced with solid back or Delville instruments. The subscribers' connections with the central are mostly made through lead-covered underground wires.

Naval Electrical Apparatus for the United States.—Representations were made by a large electrical firm in the United States to the Navy Department during the end of January to secure favourable consideration of a proposition to extend the use of electricity in the case of the three battleships, *Alabama*, *Wisconsin*, and *Illinois*, to the same degree that it is employed in the *Kearsage* and *Kentucky*. There is some difference, however, to be made in the two sets of ships. The electric power for the boat hoists and the big winches are to be omitted in the new vessels. The board of design did not make this omission on account of any failing of those fitted in the latter vessels, but because of a fear that the dynamos could not supply enough current to resist the probable maximum requirements of all the electrical machinery. If the board of design do not require that all the machinery be required at once as a condition, then the hoists will also be fitted electrically. Secretary Long and the naval experts, says *Electricity* (New York), will consider the matter, and give their decision.

Miscellaneous.

The Babcock and Wilcox Co. are pushing ahead with their marine type of water-tube boilers, they have them installed in nearly 100 vessels of all classes, doing work under different conditions in all parts of the world. One of the latest ships which they have fitted is the corvette *Ellida*, belonging to the Norwegian Navy. This vessel put into Portsmouth one day last week, and after a very rough passage from Christiania, reported that the boilers acted admirably. A careful examination of the boilers was made, and they were found to be in excellent condition. The vessel is now on a long cruise to South America. On Thursday last H.M.S. *Sheldrake* proceeded on her commissioning trial. She left Plymouth Sound at eight a.m. and returned at six p.m. This trial was made with the object of satisfying the dockyard officials that everything was working well before they passed over the machinery to the ship's officers. The boilers worked splendidly throughout, steam being produced easily, and the remarkable accuracy of this type of boiler maintained. The trials which the *Sheldrake* boilers are to be put to during the next month clearly shows that the British Admiralty are desirous of proving the value of these boilers for their war ships with a view of further adopting them in larger vessels. S.Y. Eleanor is a little yacht belonging to Sir Gilbert Clayton-East, which was fitted with a Babcock and Wilcox boiler seven years ago. She has recently been sold, and in order that the new owner might be quite satisfied, an examination of the boiler has recently been made. Very few repairs have had to be carried out, and the whole appearance of the boiler is very favourable and shows clearly that the makers are quite justified in putting high claims on the durability of their boilers.

Lengthening Well-known Liners:—The Clyde Trustees have been approached by the Clydebank Company as to graving dock accommodation for the work of lengthening the famous greyhounds, *Paris* and *New York*, in the event of the contract for this being fixed. The Trustees are prepared to lease the middle graving dock at Govan to the Company for six months, and to suit it for the work they are prepared to lengthen it some 50 ft. Plans for this alteration are in progress. If the contract is fixed the *New York* will be the first of the pair to be put under treatment. It is of interest to note that there is a decided reversion to the "long," as distinguished from the "beamy" type of boats which Messrs. Thomson, of Clydebank, themselves were greatly instrumental in bringing into favour. Cases of lengthening have within recent times been numerous, by which vessels of between 8 and 9 beams have been increased to about 10 beams in length. The North German Lloyd liner *Spree* is being lengthened to over 10 beams, and this will be the proportion of the New Hamburg-American liner building in Germany. The South African liner *Scot* was lengthened by Messrs. Harland & Wolff in 1896 to 9·7 beams to the length. This firm, it may be interesting to state, never departed from great length. The *Teutonic*, built in the midst of the revulsion in favour of "beamy" boats, is 9·8 beams in length, being much longer than any other vessel built from 1881 up to the advent of the present *Oceanic*, which is 10·07 beams, or exactly the proportions of the *Britannic* of 1874.

S. McKnight & Co., Limited.—Shipbuilding at the Ayr shipyard of Messrs. S. McKnight & Co., Ltd., under the management of Mr. Walter Scott, continues to be in a very flourishing condition, there being plenty of work in the way of both new vessels and repairs. The Company's slip hauling-up, which is counted one of the best in the West of Scotland, is occupied by two vessels undergoing repairs, one of which is of considerable size. The whole of the building berths also are occupied, so that the yard presents a scene of much activity. Messrs. McKnight & Co. expect to launch one of the larger vessels shortly, and we understand that the berth will not remain long vacant. The firm have recently been putting down new plant to expedite the work and to keep their already well-equipped yard up to the standard of modern requirements.

NAVAL ENGINEER APPOINTMENTS.

The following appointments have been made at the Admiralty from January 26th, to February 23rd, 1899:—

Adams, J. H., engineer, has been promoted to the rank of chief engineer in her Majesty's fleet.

Ash, H. E. H., engineer to the *Pembroke*, for the *Stag*, to date February 16th.

Ayers, R. B., engineer to the *Victory*, for the *Starfish*, to date February 21st.

Bath, G. C., chief engineer to the *Vivid*, for the *Cambrian*, to date January 30th.

Blundell, S. H., fleet engineer to the *Black Prince*, to date February 7th.

Bryer, S. M. G., assistant engineer, has been advanced to the rank of engineer.

Byles, G. R., assistant engineer (temporary), to the *Victory*, for drafting, &c., engine-room ratings, to date February 6th.

Chamberlain, E. W., assistant engineer, has been advanced to the rank of engineer.

Coad, H. J., engineer to the *Victory*, to date February 21st.

Coleman, A. W., assistant engineer to the *Empress of India*, to date February 20th.

Constable, J. S., assistant engineer, has been advanced to the rank of engineer.

Cook, W., fleet engineer to the *Victory*, for the *Achilles*, to date February 16th.

Coomber, T. G., fleet engineer to the *Pembroke*, additional for gun and torpedo boats, to date January 25th.

Davies, W. A. J., engineer to the *Sheldrake*, to date February 14th.

Davies, W. R., engineer to the *Centurion*, for the tender *Hart*, to date February 21st.

Davis, W. H., fleet engineer, has been promoted to be inspector of machinery in Her Majesty's fleet.

Drought, A. E., assistant engineer, has been advanced to the rank of engineer.

Edwards, E., engineer to the *Wildfire*, for the *Desperate*, to date January 30th.

Fawckner, S. M. O., engineer to the *Empress of India*, to date February 6th.

iggins, J. W., engineer to the *Hibernia*, for the *Dee and Don*, and reserve store, to date January 25th.

Frost, J. J., fleet engineer to the *Vivid*, for the *Agamemnon*, undated.

Frowd, W. S., engineer to the *Victory*, for the *Reserve*, to date February 21st.

Gallery, E., chief engineer to the *Severn*, for the *Onyx*, to date February 6th.

Gaudin, E., chief engineer to the *Victory*, for the *Spartiate*, to date February 16th.

Gibson-Sugars, J. S., chief engineer to the *Pembroke*, for the *Cossack*, to date January 30th.

Greene, C. J. (probationary), assistant engineer to the *Polyphemus*, to date February 2nd.

Hardwick, W. W., chief engineer to the *Sheldrake*, to date February 14th.

Hart, A., chief engineer to the *Pembroke*, for the *Astrea*, to date January 25th.

Hills, A., chief engineer to the *Comus*, to date February 3rd.

Hill, W. S., assistant engineer, has been advanced to the rank of engineer.

Hockey, S., staff engineer to the *Pembroke* for the *Northumberland*, to date February 6th.

Huddy, C. J., engineer to the *Pembroke*, to date January 24th, and to the *Pylades*, to date February 14th.

Hughes, T., fleet engineer, has been placed on the retired list of his rank.

Hunter, R. A., engineer to the *Revenge*, to date February 23rd.

Jackson, T. P., chief engineer to the *Australia*, for the *Leda*, to date February 13th.

Jacobs, F. G., chief engineer to the *Pembroke*, for the *Lee*, to date January 21st.

Jameson, T. O., engineer to the *Terror*, for the *Malabar*, to date February 13th.

Kitching, H. W., assistant engineer, has been advanced to the rank of engineer.

Larg, J. C., fleet engineer to the *Pembroke*, for the *Warspite*, to date January 25th.

Lawton, W. R., engineer to the *Victory*, for the *Ranger*, to date February 16th.

Legate, W. P., assistant engineer, has been advanced to the rank of engineer.

Leslie, G. N., assistant engineer, has been advanced to the rank of engineer.

Leslie, G. M., engineer to the *Pembroke*, for reserve store, to date February 1st.

Littlejohns, W. G., inspector of machinery, has been promoted to be chief inspector of machinery in Her Majesty's fleet.

Liversidge, E. W., engineer to the *Victory*, for the *Flying Fish*, to date February 21st.

Madge, H. A., engineer to the *Humber*, to date February 6th.

McGregor, D. J., assistant engineer to the *Pembroke*, for the *Pomone*, to date February 6th.

Mew, W. H. (probationary), assistant engineer to the *Pembroke*, for the *Pomone*, to date February 6th.

Moore, W. L., assistant engineer, has been advanced to the rank of acting engineer.

Moorshead, H. B., engineer to the *Colossus*, undated.

Moorshead, H. B., engineer to the *Hannibal*, to date January 27th.

Orchard, G. S., artificer engineer to the *Sheldrake*, to date February 14th.

Pamphlett, W. F., fleet engineer to the *Colossus*, to date January 25th.

Parsons, W. R., engineer to the *Imperieuse*, for the *Sparrowhawk*, undated.

Pounds, T. H., engineer to the *Imperieuse*, for the tender *Virago*, undated.

Pratt, W. H., engineer to the *Hannibal*, to date January 24th.

Rees, J. S., fleet engineer, to the *Benbow*, to date February 16th.

Rosevere, W. H., assistant engineer to the *Niobe*, to date February 20th.

Rush, H. C., engineer to the *Excellent*, additional, to date January 30th.

Shattock, T., engineer to the *Victory*, for the *Gladiator*, to date February 3rd.

Taylor, G. R., chief engineer to the *Victory*, for the *Orlando*, to date January 30th.

Wall, H. M., assistant engineer, has been advanced to the rank of engineer.

Ware, C. G., assistant engineer to the *Pembroke*, for the *Argonaut*, to date February 13th.

Weeks, E. J., engineer to the *Penguin*, to date February 1st.

INDUSTRIAL AND TRADE NOTES.

THE CLYDE AND SCOTLAND.

(*From our own Correspondent.*)

To the United Trades Council of Glasgow it was reported about mid-month by the steelworkers' delegates that an advance in wages of 5 per cent. had been received, and that this was the fourth consecutive advance which had been given within the last eight or nine months. The ironmoulders' delegate also reported an advance, and stated that the wages of the ironmoulders had reached a higher point than ever before.

The pressure on West of Scotland steel plate manufacturers for shipbuilding purposes, and the increased cost of production resulting from higher prices for pig iron and the advances in the wages conceded to the men, have had the effect of further raising the price for iron and steel ship plates and angles. The prices now asked are £7 2s. 6d. for steel ship plates, £8 2s. 6d. for steel boiler plates, and £6 15s. for steel angles; iron ship plates being £6 15s., and iron angles £6 7s. 6d., all per ton f.o.t, less 2½ per cent.

This further rise in the price of material must have its effect on shipbuilders' quotations for new tonnage, which have already advanced some 20 per cent. during the last six or seven months. Enquiries for new vessels are not, however, by any means wanting, and if fresh orders are not being placed this is probably as much due to the inability of builders to be definite about delivery than to the greatly increased prices of material and the various advances in wages. This inability is largely owing to the great delay and uncertainty experienced in getting delivery of material from the steel and iron makers, and from founders and other subsidiary branches. Of course the recent large orders foe

Government work, added to what was already on hand—considerably over 70,000 tons—does not in any degree release the builders and engineers of their burdens and responsibilities in this respect.

All the existing wages agreements between Clyde employers and their workmen expire in a day or two from the present writing—viz., the 25th—but so far, although there is undoubtedly some unrest, there have been no official intimations of demands for advances. Probably the members of the Amalgamated Society of Engineers, who are known to be considering the matter of wages, may follow the example of their fellows in the North-east Coast and go in for an advance. So may the boilermakers and iron shipbuilders, and probably the joiners and carpenters and all branches embraced in the term "White Squad;" but no difficulty is anticipated in so meeting the situation as practically to prolong the present agreements for another considerable spell.

Messrs. Robert Napier & Sons, Govan, early in the month received an order from the Eastern Telegraph Co., Limited, London, to build a cable-laying and repairing steamer 300ft. in length, having twin screws, and in some respects an advance on the four previous vessels of the same kind produced for this company by the firm. This, it is of interest to state, is the second vessel of the cable-laying type now under construction on the Clyde, Messrs. D. J. Dunlop & Co., Port Glasgow, having on hand and approaching the launching stage a twin screw steamer of 250 ft. in length for the German Telegraphic Maintenance Co.

Messrs. the London and Glasgow Co., whose establishment adjoins that of Messrs. Napier, are also credited with having received during the month an order for two large steel steamers, the owners of which are not stated.

The Water Row Shipyard, Govan, for a time carried on by Messrs. Aiken, Donaldson & Scott, who made a speciality of steam trawler building, has been taken over by an English firm noted for trawler construction—viz., Messrs. Cochrane & Cooper, Beverley, and several of these craft commenced by the former firm are now being completed, one, the *Windsor Castle*, having been launched on the 14th ult. Messrs. Cochrane & Cooper have appointed as the manager of the Water Row yard Mr. A. McGill, until lately with the Ardrossan Shipbuilding Co.

Messrs. Fleming & Fergusson, Limited, Paisley, received an order at the beginning of the month from the Russian Government to build a powerful self-propelling bucket dredger for the Sea of Azof. She is to be capable of raising 800 tons per hour, and is arranged to cut her own flotation.

Messrs. Napier & Miller, Limited, the new shipbuilding firm restarting the shipyard formerly carried on by Messrs. Napier, Shanks and Bell, at Yoker, are getting into order, and work is about to be commenced on a large steamer which they have booked for Glasgow owners. The firm have engaged the services as cashier of Mr. Geo. Thornton, till recently with Messrs. S. McKnight & Co., Ayr.

The provision being made along Clydeside to meet the greatly-increased demand for steamers of large capacity is evidenced in many ways, and especially in the laying out of new building berths on "spare" ground or on ground freshly acquired for the purpose. Messrs. D. and W. Henderson, of Partick, have plans prepared for the extension of their yard westward, the fresh ground to be taken in, enabling two additional berths and an enlargement of the existing ones to be made. The Fairfield Company, who have now their magnificent new saw mills, joiner shops, and machine sheds in fair order, and who have been consolidating the sides of their tidal basin for a considerable period, are contemplating, it is understood, taking into the working area of their vast establishment all the ground they have available to the westward of the basin. At the Clydebank establishment fresh ground is also being taken in on the west side of that company's wet basin. The accession to the working area will be devoted mainly to berths of the lighter class of high-speed paddle and other steamers, for which the Clydebank Company has a high reputation. Alterations are also now in progress connected with the present building space east of the wet basin, which will result in the formation of six building berths of the largest capacity.

All the fourteen berths in the large shipyard of Messrs. Russell & Co., Kingston, half-way between Port Glasgow and Greenock, are occupied with cargo steamers of the heavy carrying type now so much in demand, and although a very considerable extension of this yard has not long been completed, further additions are contemplated. The firm's saw mill, which adjoins the west side of the yard, occupies a frontage to the river which, if made available, would permit of four additional berths for the largest class of vessel being laid down, and this extension, it is understood, the firm are now about to proceed with. At the yard of Messrs. A. Rodger and Co., Port Glasgow, where at present five vessels are on hand, the building berths have recently been widened and extended. Messrs. Caird and Co., Greenock, are also said to be contemplating an extension of their shipyard as well as their foundry. Messrs. Scott and Co. not long ago added two building berths to their yard, and both there and at their foundry there is great activity at present, the bulk of the work on hand—the total well over 30,000 tons gross—being for the Ocean Steamship Company of Liverpool.

In spite of previous non-success the burgh of Renfrew is again to seek powers for a dock scheme, the bill for which will have modifications on the former one making it stronger than the last from the point of view of meeting the absolute needs of local shipbuilding and shipping. An essential part of the bill as it will now be presented will have reference to the formation of a graving dock large enough, it is believed, for modern steamships, but certainly having such dimensions and equipment as will meet the needs of the several shipbuilding firms carrying on business in the locality, who have decidedly long felt a want of graving dock accommodation. Powers are being sought for this scheme in face of the bill being promoted by the Clyde Trust for the construction of an extensive dock at Yoker, almost opposite the site proposed for the Renfrew undertaking, as well as for the making of another dock at Shieldhall, on the Renfrew side, but two miles or so nearer the harbour of Glasgow.

A company is also being floated in Glasgow which proposes to construct a graving dock of considerable dimensions, and to undertake a comprehensive ship-repairing and shipbuilding business, a suitable site for which has already been secured at Yoker, not very far from the site of the new tidal dock to be constructed by the Clyde Trust. Mr. John Shearer, ex-Bailie of Glasgow, and a member of the Clyde Trust, who for a number of years has occupied, and successfully carried on, the old-established ship-repairing and shipbuilding premises at Kelvinhaugh adjoining the Queen's dock, is understood to be at the head of the new enterprise, and in order to have a free hand in connection with its establishment he has just resigned his seat on the Clyde Trust. It may be stated that the premises at Kelvinhaugh are only held on lease from the Clyde Trust by Messrs. Shearer and Sons, and that they occupy a fringe of the harbour frontage, bound sooner or later to be required for other purposes. They are the highest up of any of the shipbuilding works on the Clyde, and both they as well as other and larger works would not be "out of place" further down the river.

The scheme which the new company, of which Mr. Shearer is the head, will endeavour to put in practice is certainly comprehensive. It provides for shipbuilding berths, hauling-up slipway, graving dock, tidal basin, and wharfage. The ground which the company have feued extends to about 30 acres, with a river frontage of about 2,000 ft., and a breadth backwards to the Lanarkshire and Dumbartonshire Railway of 650 ft. The building berths and the requisite machine shops and sheds will be situated at the east or city end of the site. The berths will be nine in number, and will admit of vessels of from 600 ft. downwards being constructed. Next the building berths will be the slipway, on which vessels under 2,000 tons register can be repaired, and still further along will be the graving dock running parallel to the building berths and constructed to accommodate vessels of 500 ft. or under. Still further west there will be the tidal basin, 500 ft. in length and 120 in width, running at right angles to the river, while at the west end of the works there will be a 550 ft. length of "recessed" wharfage, parallel to the river. These will provide berthing room for vessels undergoing repair. The saw-mills and wood-working machinery will be situated at the west end of the ground, the engineering department between the slipway and the graving dock, and there will be a siding from the Lanarkshire and Dumbartonshire Railway into the yard, with branch lines all over the works.

The projected graving dock, slipway, and building yard will, as has been stated, be contiguous to the projected Yoker dock of the Clyde Trust, the latter being intended for most part to serve the mineral traffic of the Clyde. It will therefore readily be understood that the chances of steady custom for the new establishment would be great, all the more so as it is proposed the graving dock should be at least 500 ft. long and quite capable of accommodating the greater number of the vessels likely to frequent the tidal dock.

What the attitude of the Clyde Trust will be in connection with these graving dock projects is not yet quite clear, but this much is certain, they are incorporating in their present scheme, before it actually comes before Parliament, a clause seeking powers to build a graving dock within the mineral area at Yoker. The effect of this will probably be to defeat the chances of both the Renfrew Graving Dock and the private one being gone on with.

Whatever the upshot may be, however, there can be little doubt that in respect to graving dock accommodation there is plenty of need for additional graving docks in scattered localities on the Clyde. The magnificent new No. 3 graving dock of the Clyde Trust has amply justified its construction already, and been requisitioned fully, as have the others of the Clyde Trust series. It is, however, precisely on account of the docks No. 1, 2, and 3 being contiguously "in series," and in the very neck of the entrance to the splendid new Prince's tidal dock, as well as being directly opposite the entrance to the Queen's dock on the opposite side of the harbour, that objection can be taken to the Trust's graving dock arrangements. The movement of shipping in and about the narrow entrances to the three graving docks, and to the immense area of the Prince's dock, not to speak of the outward entrance to Queen's dock directly opposite, or the ordinary up-and-down traffic in the harbour, are severally matters which have frequently led to something like dangerous congestion.

Beyond another private graving dock—that of Messrs. Henderson & Co., of Partick—and three patent hauling-up slips: one in Messrs. Henderson's; one in Messrs. A. & J. Inglis, of Pointhouse, and the third in Messrs. Shearer & Sons, before mentioned, no other repairing berths are available in the upper reaches of the Clyde. The formation of other graving docks—in scattered situations by preference—whether by Clyde Trust or by private enterprise, is therefore to be welcomed.

The Clydebank Engineering and Shipbuilding Co., Limited, about mid-month had most successful trials of H.M.S. *Vulture*, one of the torpedo-boat destroyers built by the firm to the order of the British Government. Notwithstanding that a stiff breeze prevailed during the trials, the vessel made six runs on the mile at Skelmorlie, and, continuing the trials for the full period of three hours, attained a mean speed of 30·4 knots with the full load on board, or nearly half a knot over the guaranteed speed. The completion of the vessel is now being proceeded with in view of her early despatch to the dockyard, and the trials of the remaining Clydebank boats will begin in due course.

The well-known Allan liner, *Parisian*, is now in Prince's dock, Glasgow, where she is to be completely overhauled by her builders, Messrs. R. Napier & Sons, who will supply new engines and boilers, and renew and improve her passenger accommodation. The *Parisian* was built by Messrs. R. Napier & Sons in 1881, and was one of the earliest Atlantic liners to be built wholly of mild steel. She has completed 147 round voyages with a total immunity from accident. She has steamed 832,621 miles, and conveyed across the Atlantic 30,326 saloon, 22,189 second cabin, and 69,079 steerage passengers—in all 121,594 souls; facts which afford very practical evidence as to her staunchness and popularity. The new machinery with which the *Parisian* will be fitted will, it is estimated, increase her speed considerably, and on the completion of the alterations in July next the vessel will resume her place in the Liverpool service of the line, in conjunction with the new accessions to the fleet—the large fast steamers *Castilian*, *Bavarian*, and *Tunisian* now building.

The *Castilian*, the first of the three screw steamers above referred to as building for the Allan Line, for their service between Liverpool and Canada, arrived in the Clyde from Belfast—where she was built and engined by Messrs. Workman, Clarke and Co.—on the 8th inst., and on the following day she went down the Firth on her trial trip, having a large and representative company on board. The other two steamers building—the *Bavarian*, in the works of Messrs. Denny Brothers, Dumbarton, and the *Tunisian*, in Messrs. Stephen's, of Linthouse—are of somewhat larger size, and are to have greater speed than the *Castilian*, which is 470 ft. by 53 ft. 9 ins. by 36 ft. depth moulded, but while in speed none of the three are intended to be Atlantic greyhounds, it is claimed for them that they will rival such craft in the comfortable character of their passenger accommodation. Again the shorter mileage of the voyage to Canada will enable their passages, when measured by time, to compare favourably with those of the higher speed vessels traversing longer routes. It is understood that the intention of the Allan Line, while thus improving their service from Liverpool—the improvements about to be effected on the *Parisian* having already been noted—is not to do so at the expense of the service from Glasgow, and that a weekly sailing will be maintained by four of their larger steamers in the course of a few months.

The Steel Company of Scotland have recently, as briefly mentioned in our last month's notes, booked orders for the castings entering into the hulls and engines for the four battleships and two of the cruisers recently placed by the Government with builders on the Thames, the Mersey and the Clyde. The bulk of the orders for the lighter steel material required for the cruisers placed at Fairfield and Clydebank have also been placed with the same company. All this, taken together with the other important work which the company already have on hand, ensures busy times indeed for the vast army of steelworkers employed at the company's several establishments.

At Motherwell a company is being formed for the purpose of starting new works for the manufacture of steel for shipbuilding, boilermaking and kindred uses. The undertaking, it is understood, will be on an extensive scale, and as the company will consist of several gentlemen who have had experience in laying down steel works in the district it will start under favourable conditions. The plant and machinery to be laid down will be up to date, and the process of manufacture will also include the latest improvements.

Messrs. Beardmore & Co., of Parkhead Forge, are at present engaged upon armour-plate orders for the British Government to the extent of 3,000 tons. They are also forging at present, under their mammoth 12,000 tons hydraulic press, seven sets of crank shafts of nickel steel, which are larger than any shafts of the kind hitherto undertaken by any forge. These are intended for the two large twin-screw Atlantic liners *La Touraine* and *La Savoia*, each of 11,000 tons and 22,000 I.H.P., now under construction in the yard of the Compagnie Generale Transatlantique at Penoet, France. The ease with which the Titanic press manipulates the immense masses of nickel steel from which the finished articles are being fashioned affords striking evidence of the marvellous capability of this wonderful tool. During last year a large number of very notable productions in the way of nickel steel shafts, etc., were produced by the Parkhead Forge, thus affording evidence of the increasing adoption of nickel steel for such important uses. Among the hollow nickel steel shafts were: crank and straight shafting for the Japanese battleship *Asahi* shortly to be launched at Clydebank; crank and straight shafting for the Japanese battleship and also for the Japanese cruiser both building at Elswick, and crank and straight shafting for the Royal Yacht building at Pembroke Dockyard. A fact of considerable note is that among the above shafts were two propeller shafts 16¼ in. diameter, and each of the great length of 74 ft. 11¼ in., with a hole bored through their length from 6 in. diameter to 11¼ in. diameter. At present the crank and straight shafts for the two first-class cruisers. *Sutlej* and *Bacchante*, building at Clydebank are in course of manufacture; as also the connecting rods and other forgings for these vessels and H.M.S. *Cressy* and *Aboukir*, the first-class cruisers building at Fairfield. An item of some note also in the work of the year was the axle for the gigantic wheel being erected at Paris, which was 26 in. to 29 in diameter, and 40 ft. 8 in. in length, having a hole 15 in. in diameter bored throughout. With disc fitted complete this weighed over 31 tons.

The Tyne has paid the Clyde another compliment in the matter of enlisting the services of a Clyde-trained manager for the Howden yard of the Tyne Commissioners. Mr. J. H. Richmond, until lately the assistant at the Clyde Trust's repairing works at Dalmuir, has now gone to the Tyne to occupy the post in question. He is not the first Glasgow gentleman who has been connected with that body. Mr. Ure, brother-in-law of the late Mr. John Elder, the eminent shipbuilder, was the engineer of the Tyne Commissioners. Mr. Richmond, it may be added, has been connected with the Clyde Trust Works for about seven years, and received the above appointment out of a list of 360 applicants.

The British Corporation for the Survey and Registry of Shipping have appointed Mr. George A. Nicol, formerly assistant superintendent to the Clan Line, and Mr. Ernest Elvidge, from the Thames Iron Works, as exclusive surveyors at the head office of the registry in Glasgow.

Bilge keels have some disadvantages—such as the inconvenience they offer in docking vessels and sometimes to vessels lying against piers, &c.—all of which no doubt have discouraged their adoption, although their value as a steadying factor in vessels given to roll have been partly recognised. It may be regarded as additional testimony to the fact that their efficacy in this respect is being the more appreciated that the *State of Nebraska*, built so long ago as 1880 by the London and Glasgow Shipbuilding Co. for the State Line—since merged in the Allan Line—is at present in one of the Clyde Trust graving docks, Govan, having these features fitted to her bilges.

Though the production of sailing vessels on the Clyde is now an entirely negligible quantity—only one having been built last year, and none at all being at present on hand—the sailmakers of the district have apparently regarded the time as opportune for striking work for an advance on their wages. That demand is for ½d. per hour of advance, and the sailmakers have been "out" since mid-month by way of enforcing their request. At a private conference of the employers on the 11th ult. the situation was discussed, and it was determined that, as the men had refused to accept the offer of ¼d. per hour advance, their present demand be refused. This finding was unanimous, and the employers present at the conference declared that they would be able to carry on business notwithstanding the strike of the employees, the bulk of the business not being of a particularly pressing character. Meantime advertisments for men are being published, and a twelvemonth engagement is offered at a weekly wage of 31s. 6d.

In the various shipyards at Dundee work is still plentiful, and all grades of workmen are busy. The Caledon Co., who have several vessels under way, including a large steamer for Messrs. Leyland, of Liverpool, launched during the month the *Saltees*, a screw steamer of 1,250 tons gross, built to the order of the Clyde Shipping Co. The vessel is the sixteenth the Caledon Co. have turned out for the same owners, and there is also under construction a sister ship to the above, to be named *Turnberry*. They are intended for the passenger and cargo trade between Glasgow and London. At the engine works of the Caledon Co.—Lilybank Foundry—there has just been introduced an electric overhead crane, the first of the kind in the district. It is of 40 tons capacity, and traverses the erecting and turning shop, 300 ft. in length. The crane, which is giving great satisfaction, adds materially to the effectiveness of the Company's extensive premises at Lilybank.

The Dundee Shipbuilding Co. about mid-month launched the *Windsor Castle*, the largest steam trawler ever built at Dundee. She is 120 ft. long, and is to the order of the Castle Line Steam Fishing Co., Limited, Great Grimsby. She will be fitted with powerful triple expansion engines by Messrs. Cooper and Greig, Dundee.

THE TYNE.

(*From our own Correspondent.*)

Shipbuilding.—The whole of the yards on the Tyne being as full of work as could be wished, it is not a matter for surprise that a condition of high pressure actively exists throughout, and that every possible means to accelerate production is being availed of. Two circumstances, however, have tended to hinder progress, these being the continued unfavourable weather, and the difficulty of getting supplies of material from the steel works. The irregular attendance of a section of the operatives has also exercised an obstructive influence upon work; but this bad practice has apparently undergone some modification, and, so far as this year has gone, has not been so conspicuously followed as in the later months of last year. But for the causes of hindrance mentioned, the output of the Tyne yards would doubtless have reached a much higher total than the actual result recorded, which was, in January, a cruiser, a torpedo destroyer, and a merchant vessel; and in February, two merchant ships. These, however, were of rather large size, and made up between them the respectable total of 14,000 tons. It will require a much quicker rate of output than is indicated by the foregoing to enable shipbuilders to approach, even approximately, in the present twelve months, the splendid results in output which made last year a record one; favourable weather may naturally be looked and steel manufacturers are, as far as possible, increasing productive resources, so that during the remainder of the year better progress is likely to be made, and better results achieved. There has not been much done in the way of placing new orders this year, though inquiries are far from scarce, and in some cases shipowners are urgent enough to have their requirements in new tonnage promptly arranged for. The question of delivery, however, is a standing impediment to the expeditious closing of contract arrangements, for shipbuilders find it impossible to meet the wishes of their clients in this respect. In these transactions there is, of course, but one way of coming to terms, namely, the acceptance by the shipowner of whatever date for delivery the builder may think himself in a position to name. We believe we are correct in saying that few, if any, contracts have been placed this year in which the term allowed for building does not extend into the summer of 1900.

Messrs. Armstrong, Whitworth & Co. have a couple of large cruisers getting fitted out at their Low Walker Yard, and the powerful ice-breaker which was launched in the autumn of last year is being got ready to take her departure for the region where the might of her hull and machinery is to be brought into requisition to make a navigable avenue through the ice. An exhaustive and highly satisfactory trial of the machinery took place on the 18th ult. It is understood that the company have received an order for another ice-breaker of the heaviest class, and it is probable that a large amount of business in this line will come to them in the future. The company is, indeed, achieving as great a reputation for the building of ice-breaking vessels as for the building of warships, and this, it will be admitted, is saying a good deal.

Messrs. Wigham, Richardson & Co. have not lost much time in adapting their newly acquired ground for utilisation, and have already formed two very large building berths within its area. In one of these, a boat which is to be over 500 ft. long, and is understood to have been ordered by a German steamship company, is being put down, a portion of the centre keelson structure being in position. The other berth is not yet quite completed, but good progress is being made with it, and it is understood that it also will have an occupant as soon as it is ready. It is understood that the firm have orders for high-class vessels from the Pacific Steam Shipping Company and from the Austrian Lloyds, besides other work of a special kind. The next boat to be launched is of exceptionally fine lines, and of yacht-like appearance, being apparently designed for the attainment of a high rate of speed. There is also a very smart looking vessel receiving her final equipment of machinery and fittings in the water.

Messrs. W. Dobson & Co. are putting down an exceptionally large vessel, and have two others of lesser size in advanced stages on the stocks. It is reported that the firm have a twin-screw boat to build, which is intended for a special service. Messrs. Wood & Skinner have several cargo boats and a couple of fishing vessels in course of construction, one of the latter having just been put into the water.

At the yard of Messrs. C. S. Swan and Hunter excellent progress has been made—notwithstanding the time unavoidably lost through bad weather—with the construction of the important vessels in hand, and the forward section which was commenced a few weeks ago, to complete the hull structure of the s.s. *Milwaukee*, is already well advanced. It will be remembered that the latter vessel was wrecked, and that the after part, including the engine and boiler rooms with their contents, was successfully floated and towed to the Tyne, the forward section being irrecoverable. The building of the great pontoon to be located at Jarrow Slake which has been talked of does not appear to have been as yet definitely decided upon, but should an affirmative decision be arrived at the contract will doubtless be placed with Messrs. Swan and Hunter, who may be regarded as specialists in pontoon building.

Messrs. Hawthorn Leslie and Co. have four vessels on the stocks, three of which are of exceptionally large dimensions, and are intended for the colonial meat trade. The firm have also a a vessel under repair in the graving dock, and two in the river being fitted out. At Messrs. Stephenson's yard all the available building space is occupied, a good part of the ground being taken up with the Spanish pontoon, which was ordered for location at the Philippines long before there was any sign of political disturbance in that quarter of the world. It is not probable that, under existing circumstances, the pontoon built by Messrs.

Stephenson will ever find its way to the destination originally intended, though it is quite on the cards that the Spanish authorities will take it over as soon as a suitable mooring place at home or in another of their colonies has been selected for it.

The Palmer's Shipbuilding and Iron Company have some half-dozen vessels in various stages on the stocks, and several others in the water, receiving their machinery, &c. Palmer's is the only Tyneside firm that has launched two vessels this year, one being the *Spiteful*, a torpedo destroyer and the other the s.s. *Montford*, of 8,000 tons carrying capacity, ordered for the meat trade by Messrs. Elder, Dempster and Co.

The Tyne Shipbuilding Company have their three berths occupied with vessels in the different stages of framing, plating, and making ready for launching, and have also a large vessel in the water fitting out. This vessel, which is ordered by a Copenhagen firm, is being engined by Messrs. Blair, of Stockton, and will be fitted with Cedervall's protective lubricating box on the propeller shaft. At Messrs. Readhead's yard there are five new vessels in progress (one being at the shearlegs receiving her machinery) and an old one undergoing repair. Messrs. Eltringham's yard, and also the yards of Messrs. Edwards and Messrs. Rennoldson, are well occupied with vessels of a small class, and at the various repairing establishments business is fairly good.

At the new yard of Messrs. Parsons and Co. no boats have yet been laid down, but the Northumberland yard is apparently quite full of work, there being four vessels on the stocks and one in the water fitting out. This latter vessel is the first one launched by the firm, and was commenced about Midsummer last year. It is stated that Messrs. Grace & Co., of London and New York, have ordered from this firm a steamer of 8,000 tons capacity, for their New York and Pacific trade. The North-Eastern Marine Engineering Co., of Wallsend, are to supply the machinery.

Engineering.—Great activity continues to characterize the engineering business of the Tyne, the pressure of work in the marine engine establishments being still quite abnormal. Messrs. Hawthorn, Leslie and Co. have a set of warship engines (twin screw) to build, for which, we understand, the shafting has been ordered from Messrs. Charles Cammell and Co., of Sheffield, and Messrs. Wigham, Richardson and Co. have also some exceptionally important contracts to deal with. The Wallsend, Shipway and Engineering Company are as busy as possible, and have some important repair contracts to supplement the new work in hand. The North-Eastern Marine Engineering works are also busy with new and old work, and at the Palmer Company's works the orders in hand are sufficient to keep the machinery going steadily for a year or more.

Mr. George Robson, engineer and ship repairer, Tyne Dock entrance, has been particularly busy in repair work this year, and is at present engaged in carrying out rather extensive repairs to the s.s. *Lockwood*, the s.s. *Rodney*, and the s.s. *Northumbria*. Other contracts are being negotiated for, and there is every reason to expect a continuance of active business at this establishment for some time to come.

Messrs. Henry Watson & Sons, High Bridge, Newcastle, are experiencing a good demand for their well-known Westminster ballast pumps, with patented improvements, and the department of the works devoted to their manufacture is kept exceedingly busy. In the other departments business is also brisk.

Mr. W. F. Snowdon, of No. 2 Side, Newcastle, has received a good many orders this year for Morison's Evaporator, for which speciality he is the local agent, and the enquiries still coming to hand show that this excellent appliance is daily becoming more widely appreciated.

Tyzack's triple grip anchor continues to maintain its popularity among shipowners and masters. Thanks to the resources at their command the manufacturers are able to keep pace with the steadily increasing demand, and orders are fulfilled with as much promptitude as at any preceding period. "The "Triple-grip" anchor is unrivalled for holding power, having three palms or flukes, which are bound to strike the ground simultaneously. The peculiar construction which produces this effect also prevents the possibility of the anchor turning out of the ground when holding, and rolling over. There are many other excellent features connected with this anchor,' and it is not at all surprising that its merits have obtained recognition from governments and leading steamship companies throughout the world.

THE WEAR.

(From our own Correspondent.)

Shipbuilding.—The extensions and alterations which were inaugurated a few weeks ago at various yards on the Wear are being pushed forward with commendable energy, and by midsummer the appearance of the establishments referred to will have undergone a very striking change. The productive resources will at the same time be very considerably increased, and it is not improbable that this increase of capacity will have its effect on the year's output.

There is a probability that a small yard at South Hylton, which was formerly used for shipbuilding purposes, will again be occupied by a firm who, it is understood, intend going in for the building of fishing craft and other vessels of the lighter kind. Messrs. Osborne & Graham, of the North Hylton Yard are busier now than for some time past, and in the current twelve months are expected to improve largely upon last year's output.

Messrs. Short Bros. have, as usual, their berths fully occupied, and at Messrs. Doxford's establishment there are four vessels on the stocks, all of them being "turret" ships of large tonnage.

Messrs. Priestman & Co. have six vessels in hand, and at the two other Southwick yards the whole of the berths are filled. Sir James Laing & Sons are now provided with more building space than any other firm on the river, and at present the whole of it is being utilised. The tender of Messrs. Robert Thompson and Sons for the building of a small ten-knot steamer has been accepted by the Eastern Sea Fisheries Committee.

Messrs. Bartram & Sons launched, on the 13th inst., a fine steamer, 365 ft. long, for Messrs. Houston, of Liverpool, and Messrs. Blumer and Sons launched on the same day a steamer, 320 ft. long, for Messrs. Runciman, of Newcastle.

The frame-turning departments at Messrs. J. L. Thompson & Sons are kept in active operation, and as good supplies of material are being received, the prospect of a large output being attained this year is excellent. At the Sunderland Shipbuilding Company's yard, and also at the Strand Yard, work is plentiful, and at Messrs. Austin's establishment a similar condition of things exists.

Engineering.—The activity at the marine engine works is fully maintained, night work being still very generally resorted to. Manufacturers of steam winches and steering gears are also busy, as also are the makers of ash hoists and steamship accessories generally. At the forging establishments orders continue to be plentiful, Ray's Pallion Forge being particularly well supplied in this respect. Foundries are also kept briskly going, and at the Monkwearmouth Ironworks a good weekly output is maintained.

The Hartlepools.—During the interval between January 10th and February 8th, three vessels of large size were launched at this port, and two or three others are now about ready for leaving the stocks. In addition to the large amount of new work now in progress, there is a good quantity of repair work in hand, and employment for labour is abundant. Engineering establishments continue busy, and both foundries and forges are well employed. The Hartlepool steel works are as busy as could be wished, but at the docks business is somewhat quiet, timber imports having largely fallen off.

Stockton.—Shipbuilding at this centre is still brisk, and at the engine works no abatement of the high-pressure activity previously noted, is apparent. Bridge works and boiler works are kept going night and day, and the same may be said respecting steel and iron works, which are scarcely capable of coping with the great demand existing for material.

Middlesbro'.—The shipbuilding yards are still quite full of work, and it is understood that some further orders, on conditions of deferred delivery, have been booked. In the steel and iron trades business is exceedingly active, and prices are firm, with a tendency to advance. Bridge works are well off for orders, and manufacturers of girders for use in buildings are having more orders than they can conveniently deal with. At the docks there is less activity than was noticeable towards the close of last year.

Consett.—At the Consett iron and steel works business is very active, and, largely as the productive power has been increased in recent years, it is still barely adequate to meet the requirements of the company's numerous customers.

THE MERSEY.

(From our own Correspondent.)

NO falling off whatever is noticeable in the generally satisfactory outlook as regards all branches of the shipbuilding, marine, and general engineering trades of Lancashire. The pressure of work continues quite as great as ever, and the difficulty just now is not with regard to securing new orders to replace those running out, but to comply with requirements of customers as to delivery. In many cases orders have to be cancelled because engineering firms are unable to put work in hand within anything like a reasonable period, and the present exceptional activity of trade is certainly fully assured right through the remainder of the present year.

The monthly returns issued by the trade unions show an exceptionally low unemployed list. The Steam Engine Makers' Society has still only about one per cent. on donation, and in Manchester and several other local centres, it has practically no unemployed members, the demand for workmen in some departments being greater than the supply. The only direction in which this society reports any slackening off is in the ship repairing trade, and this is attributed to the fact that vessels are just now as a rule too busily engaged in voyages to put in for repairs. The United Machine Workers' Association has now only about 3½ per cent. of its total membership on trade donation, whilst in the Manchester branches there are only 2½ per cent. of unemployed members, and throughout the Lancashire district the proportion is generally about three per cent. In Glasgow, Elswick, Barrow, Bradford, Doncaster, Grantham, Halifax, Blackburn, Ashton, Crewe, Preston, Gloucester, Newcastle, Wigan, Edinburgh, Woolwich, Erith, and Grimsby, this organisation has no members on donation. Out of fifty branches, thirty-three report trade as "good," and the remainder as "fair" or "moderate." The activity in trade is giving rise to movements for higher wages, and the machine workers at Bolton and Blackburn have during the past month sent in demands for a 2s. per week advance.

Messrs. Laird Brothers, of Birkenhead, state that there is nothing special to report this month with regard to work at their yards. By the time these lines appear in print, however, they will have launched a new steamer for the South-Eastern Railway Co.'s Folkestone and Boulogne service, of which we may be able to give some particulars in our next issue.

The above firm have during the month sustained a severe loss by the death of their senior partner, Mr. Wm. Laird, which took place on the 7th inst.

An important development in connection with marine engineering in this district is a large extension of the Openshaw works of Sir Wm. Armstrong, Whitworth & Co., Limited, where the erection of a large range of new workshops has been commenced during the month. A portion of this is intended for an enlargement of their well-known ordnance department, but quite a new feature is being introduced in the manufacture of armour plates for war vessels. For this purpose extensive workshops are being erected, and a complete plant is being put down, which will enable the firm to compete with the Sheffield armour-plate manufacturers in meeting the requirements of British and foreign governments for the equipment of war vessels. This will bring an altogether new branch of industry into the district.

Messrs. J. E. H. Andrew & Co., Limited, of Reddish, near Stockport, are introducing an entirely new design in their large size gas engines, which will be found suitable for marine engineering and other works where heavy machinery requires to be driven. This constitutes quite a departure from the usual type of gas motor—the general arrangement very much resembling that of an ordinary steam engine with the cylinder cast on a long solid bed. The essential object of the design is to thoroughly support the cylinder so that it is not over-hung in any way as in the ordinary type of gas engines; and another special feature is an outside cross-slide which takes the thrust of the connecting rod. These engines are only constructed for heavy driving, from 100 to 150 h.p., and have already been supplied to some of the railway companies. It may be added that Messrs. Andrew whose "Stockport" gas engines have for many years been well-known in the trade, have now adopted entirely the "Otto" cycle for the engines the are making, whilst a number of new features have been introduced. In their lattest patterns the cylinder jacket is cast with the frame, so that the cylinder, as already noted, is not overhung in any way, whilst the strength of the engine generally is thereby greatly increased. Further, all the engines are fitted with separate cylinder end, or combustion chamber, which removes any danger of accident through frost or otherwise, to the main cylinder, and also enables a loose liner to be employed, which is fitted on an improved system and can be readily replaced.

The Vulcan Foundry, Limited, Newton-le-Willows, have received an order from the London, Brighton & South Coast Railway for fifteen express goods' engines of the same type as those previously supplied by this firm a few years ago.

The iron trade has, during the past month, shown no recession from the firm tone recently reported. There has, it is true, been some unsettlement in the market as a result of the fluctuations in warrants, which have tended somewhat to induce caution on the part of buyers, but this does not affect the position so far as legitimate business is concerned, and makers who are generally well booked and indifferent about new orders just now, are not only holding firmly to their quoted rates, but show in many cases a tendency to further stiffen up in their prices. Local makers do not now quote under 55s. 6d. less 2½, for No. 3 foundry less 2½d., and district makers about 52s. 6d. to 53s. 6d. net for foundry Lincolnshire, and 53s. 9d. to 54s. 6d. for Derbyshire, delivered, Manchester. Forge qualities are very scarce, with Lancashire firm at 53s. less 2½d., and 51s. 2d. to 51s. 8d. net delivered Warrington. Outside brands remain much as last reported, Middlesbrough ranging from 56s. 4d. G. M. Bs. to 57s. 4d. for good named maker's brands, net cash, by rail Manchester, with Scotch iron, delivered Manchester Docks, 59s. 9d. to 60s. for Glengarnock, and 60s. to 60s. 3d. for Eglington, and American No. 3 foundry, 55s. net cash.

In the finished iron trade, prices for bars have shown a continued hardening tendency, and a further official advance is expected. The general quotations for Lancashire bars are £6 17s. 6d. to £7, with Yorkshire and North Staffordshire qualities £7 delivered here. Sheets are in better demand, and now average £7 15s. to £8. Hoops are practically unaltered, with list rates steady at £7 for random to £7 5s. for special cut lengths delivered Manchester district, and 2s. 6d. less for shipment.

A continued pressure of activity prevails in the steel trade, with a hardening tendency in prices, which average about 68s. 6d. and 69s. to 70s. less 2½ for No. 3 foundry hematites; £5 net for local billets; £7 10s. to £7 15s. for steel bars; £7 12s. 6d. to £7 15s. for common plates; and about £8 10s. to £8 12s. 6d. for boiler-making qualities delivered in this district.

In the metal market there has been a further upward move of ½d. per lb. on brass, and ¼d. per lb. on copper tubes, sheets, and wire. Business, which was previously active, has been checked by this advance, and is just now limited to only moderate quantities for actual necessities. Delivered Manchester district list rates are now as under:—Solid drawn brass boiler tubes, 8¾d.; solid drawn copper tubes, 11d.; brazed copper gas and steam tubes, 10¾d.; brazed brass tubes, 10d.; common rolled brass, 8¼d.; common brass wire, 8½d.; copper wire, 9¼d. per lb.

Business in the timber trade has been quiet; the arrivals have been fairly moderate, but the deliveries have been small. Stocks are ample, and there is little alteration in values to report. The import of teak has been moderate, consisting chiefly of planks; prices are very firm and the stock is light. Both for squares and planks enquiry has been more active. Only one cargo of greenheart has arrived, but the consumption has been small, and prices are unchanged.

The coal trade maintains a steady tone, business being active in most descriptions, and prices strong throughout. The demand for house coal has fluctuated somewhat with the changes of weather, but generally business has been somewhat more brisk, and prices are firm on the improved basis. The lower descriptions of round coal met with an active demand for iron making, steam, and general manufacturing purposes, and prices are maintained at recent full rates. The demand for engine fuel continues in excess of the output of most of the Lancashire collieries, and there is less competition with supplies offering from outside districts. Prices at local pits are consequently exceedingly strong; in fact, they have shown rather a hardening upon last month's rates. At the pitmouth best Wigan Arley averages 12s. to 12s. 6d.; Pemberton four ft. and seconds Arley, 10s. 6d. to 11s.; common house coal, 9s. 6d.

to 10s.; steam and forge coal, 8s. 6d. to 9s.; engine fuel, 6s. 3d. to 6s. 9d. for best; 5s. 3d. to 5s. 9d. for medium, and 4s. 9d. to 5s. for common sorts.

Shipping has been tolerably active, with prices steady at about 9s. 6d. for ordinary steam coal delivered Garston Docks; 10s. High Level, Liverpool, and 10s. to 10s. 6d. Partington tips, Manchester Ship Canal.

THAMES.

(*From our own Correspondent.*)

A VERY important speech has been made by Mr. A. F. Hills, of the Thames Ironworks. The occasion taken for making the speech was the prize distribution of those attending classes connected with the works, and also a kind of annual festival of the Thames Ironworks federated clubs. The speech was important because it dealt with the working of the eight hours' day at the works. It is known that the Thames Ironworks have obtained the order for two new battleships, and in this prospect Mr. Hill said he saw in front of him three full years' work; and last year he had to tell them of the biggest year's work they had ever done since the works started. After the launch of the *Shikishima*, Mr. Hills began to feel a little dull, and had some anxiety with regard to the future. Seven years ago they had strike after strike; the whole neighbourhood was as if stricken with the strike fever. There were the shipwrights, then the carpenters, then the engineers. The only pleasing recollection he had was when bands of music were about playing the "Dead March" was that they never got the better of him. The whole aim of himself and they was to place the Thames Ironworks in the front of the engineering world—a position won for the works, in the navies of the world, which built the armoured battleship the *Warrior*, more than thirty years ago. In 1892 they started the "good fellowship system." It established the principle that everybody should have an interest in the work he did, and that if he was able to produce that work with an extra efficiency and economy, the benefit should go into his own pocket, and nobody else's. In 1892, the amount paid to the workers under this system was £4,804 11s. 9d.; in 1893, it was £2,503 16s.; in 1894, it was £1,112 16s.; in 1895, it was £5,852 2s. 6d.; in 1896 it was £5,081 13s. 6d.; in 1897 it was £7,774 5s. 7d.; and in 1898 it was £15,390 4s. 7d., which makes a total of £42,519 10s. 11d. paid in "good fellowship" dividends at the end of each successive month in seven years. These dividends were direct additions to the highest wages paid in our trade in this country, and paid on work which was being wrought out on an eight hour's day. It was in 1894 the eight hour's day system was adopted. "I will read," he said, "to you the results as shown in our wages sheets, and you can judge whether the experiment has brought up more work or less, whether it has made us unable to compete with our neighbours or not, whether it has hindered us, or has proved a great stimulus to further effort. During the engineers strike Mr. Hill was engaged trying to obtain concessions, and some one wrote to *Fairplay*, and the editor in comment said Mr. Hill was like the fox who had lost his tail,and tried to persuade others that it would be a good thing for them to lose their tails also. He wrote back to say that instead of having lost his tail, it was getting bigger and bigger, so big, indeed, that the works were not large enough to hold it. I will show that by the wages paid. In 1893 they were £99,066; in 1894, £102,465; in 1895, £147,790; in 1896, £163,666; in 1897, £223,912; and in 1898, which was a record year, £242,838, showing that the amount of wages paid had increased under the eight hour's system by 145 per cent. The next question is that of cost. Can the Thames Works compete with other shipbuilding firms? The cost per ton has decreased by 17 to 18 per cent, and the wages bill has risen by 15 per cent., and besides that, £100,000 worth of machinery has been introduced to the works. And what with the better feeling of the men, and the improved machinery, he has been enabled to get contracts for two battleships with engines at the lowest price of all that was put in. They have had to cross the water and take over the works of John Penn and Sons, and so carry to the south side the eight hours' flag. Then there is the civil engineering department, the dry dock department, and the marine engineering department. In the shipbuilding department they have contracts for two millions, in the others, contracts to an equal amount, and so the eight hours' system has brought him in nothing but blessing. Work is pouring in to them from all parts of the world, and the most flattering testimonial they have ever received was from the Chairman of the Royal Lifeboat Institution, asking if they would be willing to undertake the entire construction and repairs of all the lifeboats in the United Kingdom on a basis allowing for a fair profit. They had in connection with the works the orchestral society, the military band, the choral society, the dramatic society, the football club, cricket club, &c.

Babcock & Wilcox.—The Norwegian corvette *Ellida*, which has recently been re-boilered with the above type of boiler, left Horton on Tuesday, the 7th inst., and arrived at Portsmouth on February 15th. Mr. Metcalfe, of Babcock & Wilcox, examined the boilers on her arrival, and found they had behaved exceedingly well during the very rough voyage. The ship was originally bound for Falmouth, but owing to the rough weather she had to put in at Portsmouth instead. The engineer says the feeding was steady, the steaming was everything that could be desired, there was no flaming at the funnel and hardly any smoke. The engineer put lime into the boiler regularly.

On opening up the forward boiler at Portsmouth the inside of the tubes was found to be perfectly clean, and the inside of the drum satisfactory. The tubes were tested with a straight edge from the furnace and all found to be straight; in fact the chief engineer, whose name is Jonassen, and the second engineer, named Brath, are both high in praise of the boilers. The commander also says that he is perfectly well satisfied with their working so far. The vessel is bound for South America, and she is not expected to be back in her own country until the summer of this year, so that the Norwegian authorities evidently have every confidence in being able to send the ship away on a very long cruise. The following orders have been booked by the Babcock and Wilcox firm this year:—

Cruiser *Alert*	2 boilers	1,000 I.H.P.	U.S.A.
City of Nanaimo	1 „	750 „	
S.S.	2 „		Zenith Transit Co., Dulwich.
SS.	2 „		Minnesota ss. Co.
SS. *Wyoming*	4 „		U.S.A.
SS.	2 „		Cleveland Shipping Co.

In connection with this matter a most valuable report has been made by Commodore Melville on water-tube boilers in the United States Navy. In this report he first points out the advantage of being able to refit the vessels with these new type boilers without disturbing the decks. The new boilers being made in pieces can easily be fitted up without much trouble to the ship. His words are: "This was the case in the *Monterey*, and it was strikingly illustrated in the case of the *Canonicus*, *Manhattan*, and *Mahopac*, where it would have been impossible to use any but water-tube boilers without practically rebuilding a portion of the hull." Then Commodore Melville alludes to the suddenness of the war, to the navy, and the straits they were placed in for efficient vessels. There were a number of old single-turret monitors which could be turned into harbour defence vessels if made seaworthy, but their boilers were done and it was necessary that they should be refitted with boilers in the shortest possible time, and then he goes on to tell of a feat like that of Cæsar, who built a fleet in a month and had them ready for their station in that time. "These old single-turret monitors were susceptible of fair use as harbour defence vessels if they could quickly be made seaworthy, and one of the most notable engineering feats was in connection with this work, and consisted in cutting out the old and worn out boilers of the three above-named monitors and erecting new boilers in their places without cutting the decks, and all within the space of thirty days." Babcock and Wilcox had the contract, and Mr. Melville says they deserve great credit for the expedition with which it was done. It appears that before war was declared it had been ascertained that the firm just mentioned was the only one that could do the work in less than three months, and in less than five hours after the contract was obtained for the fitting of the new boilers the work of building them was commenced, and it was a source of satisfaction, said Mr. Melville, that the performance of these vessels with the new boilers exceeded that of the vessels when first built.

The United States Admiralty Board, like the Admiralty, appear from the report of the chief of the Bureau of Steam Engineering, to intend to adopt exclusively water-tube boilers in the vessels that may be built for the United States Navy. In the report it is pointed out that, "it having been decided that the new ships should be practically identical with the *Alabama* class, and no hull changes would be permitted that it was impossible to use. water-tube boilers as that would have involved a re-adjustment of hull weights to maintain the time." Mr. Melville further says: "The demand upon the engineer for great power on small weight in order to secure the higher speed for all classes of vessels which are now common, has practically ruled out the cylindrical boiler," and he says "the tactical importance of water-tube boilers is also being thoroughly recognised, and that this has been emphasised in the blockade of Santiago and the great victory that ensued." With respect to the advantages offered by those boilers to the quickness of raising steam he says. "It was necessary for a long period that our ships should be ready to develop maximum power at a few minutes notice, and with cylindrical boilers this involved keeping all the boilers under steam with heavily-banked fires and an attendant large consumption of coal. Water-tube boilers of the proper kind, which admit of the rapid raising of steam with safety remove this difficulty, and give the commanding officer a more complete control of his fighting machine." He refers to the excellent work done by the *Marietta* and the *Oregon*. The *Marietta* made a trip, leaving San Jose de Guatemala on March 16th, and arriving at Key West on June 4th, having been under steam continuously for nearly three months, and having covered a distance of over 13,000 miles at an average speed of 9·2 knots. . . . "The special point to be noted in connection with both vessels is that after more then a year's commission, during which time they have steamed thousands of miles, the boilers of both vessels are in excellent condition and ready for service; they have withstood the test of long periods of actual cruising just as well as cylindrical boilers, and with as few mishaps as any, and much fewer than some. In the case of the *Marietta*, all that was called for at the end of her long trip were a few fire-bricks, and the *Annapolis* needed nothing."

BELFAST.

(*From our own Correspondent.*)

BOTH the Shipbuilding and Marine Engineering Trades in this district continue to be very actively employed. No new orders are reported to have been booked since the beginning of the year, but most of the Belfast shipbuilders have as much work on hand as will keep them exceptionally busy for some time to come.

The s.s. *Castilian* left this port on 7th February for the Firth of Clyde, where she ran a most successful trial trip, a speed of 15¼ knots being attained. This steamer has been built by Messrs. Workman, Clark & Co., Limited, to the order of the Allan Line Company, Glasgow, and has been specially designed to meet the modern requirements of the Canadian trade. She is the first of five vessels which are being built for the Allan Line, orders for three of which have been placed with Messrs. W. C. & Co., Limited. The dimensions of the *Castilian* are as follows:—Length, 470 ft.; breadth, 53 ft. 6 in.; depth moulded, 36 ft. She has been built to the highest class in the British Corporation Registry, has Board of Trade passenger certificate, and is fitted to comply with the requirements of the American Passenger Act. Accommodation has been provided for upwards of 90 first-class passengers, 80 second-class, and 200 third, and special arrangements have been made so that accommodation for much larger numbers of second and third-class passengers can be provided when required. There are four complete decks in all, besides an upper bridge deck, on which the lifeboats are carried, and which forms a promenade for first-class passengers. The hull of the vessel has been considerably augmented in strength over the requirements of the Registry, in order to suit the heavy weather of the North Atlantic, and the vessel has been subdivided into eight water-tight compartments, those at the extreme ends being suitable for carrying water ballast, while the hold immediately abaft the machinery space can be used as a ballast tank when necessary, and can contain over 900 tons of water. A cellular double bottom has also been constructed, capable of containing about 1,200 tons of water ballast, and extending the entire length of the holds and machinery spaces. A complete installation of electric light has been fitted by the *Globe Electrical Company, London*, and the living rooms throughout the vessel are heated by steam in a most complete style, and with the latest style of fittings. Six large hatches have been provided for the rapid loading and discharging of cargo, and each of these has derricks suspended from the masts or crane posts, which in turn are worked by ten powerful steam winches. Refrigerating storage chambers have been provided for the carriage of perishable goods, the forward portion of the lower 'tween decks being insulated for that purpose. Triple-expansion engines have been fitted, which were also constructed by Messrs. Workman, Clark & Co., Limited, and steam is supplied by four boilers—three double-ended and one single-ended—working at a pressure of 200 lbs. per square inch, and all are fitted with Howden's system of forced draught. The vessel is steered by powerful gear, fitted up in the wheel-house aft, controlled by the pilot-house amidships, and consisting of a vertical steam-steering engine of Harrison's make, and connected direct to quadrant on the rudder-head with patent spring tiller arrangement. There is also a screw steering-gear fitted to work by large hand wheels.

The new steamer *Afric*, built by Messrs. Harland & Wolff, Limited, for the White Star Line, has during the past month left this port. This steamer is the first of three duplicates for the same company, and her dimensions are:—Length, 500 ft.; beam, 63 ft.; depth, 44 ft., and gross register about 12,000 tons. Early in the month she ran a most successful trial trip in Belfast Lough, and after adjustment of compasses proceeded to Liverpool.

The s.s. *Oanfa*, belonging to the China Mutual Steam Navigation Company, Limited, has also left this port during the past few days. This vessel arrived here in the beginning of the year, in order to have her engines and boilers overhauled, but it was found necessary to take out her boilers, so that a new tank top might be fitted. These repairs having been completed, the vessel left on 12th inst. to take up her old station. The alterations were carried out by Messrs. Workman, Clark & Co., Limited.

NORTH-WEST OF ENGLAND.

(*From our own Correspondent.*)

Barrow-in-Furness.—The growing and expanding features of the shipbuilding trade at Barrow are still very pronounced, and every month sees further developments in shipbuilding operations, more extensions of works, new additions to plant, and a general tendency to increase the capacity of the naval construction works of Messrs. Vickers, Sons, and Maxim for dealing with a much greater volume of work. It is already a fact that the biggest ships in the world can be built at Barrow, where there is the largest shipway in the kingdom, the greatest depth of water to launch into, and an immense sea area of launching ground in Walney Channel. The area of the shipyard department of Vickers' works is being considerably enlarged, as stated in these notes last month, and in the course of a few months the yard will be nearly double its present size. The extended portion will be chiefly utilised for small craft and the present yard used for the heavier type of shipping now engaging the greatest share of the firm's attention. Some idea of the present size of the building yard may be obtained from the fact that there is at present on the stocks H.M.'s battleship *Vengeance*, two first-class cruisers for the Admiralty, a Japanese battleship, a Pacific liner, and two British-African steamers, and there is still room for putting down three or four other ships. In all probability the third first-class cruiser of the improved *Powerful* type will go down on the ways of the *Vengeance* when she is launched in April next. This battleship, the first built at Barrow, is in a forward state so far as her structural work is concerned, and she already totals up to a heavy tonnage standing on the ways. The launch will doubtless be a red-letter day for Barrow, as this is the first battleship of what is sure to be a long list to be built at Barrow yard, it being the intention of Vickers, Sons, and Maxim to devote special attention to this class of work in the future, and the fact that this firm produces armour plates which are known to be among the best manufactured in the world, and also produce heavy guns which have been proved to be the most destructive weapon yet invented, will certainly operate in their favour in any orders for the home or foreign governments which may come into the market. Already the firm has won great repute in the work already done for the British Admiralty and for private owners. There is reason to believe that their good record will act favourably in their case when orders are in the market for the highest class of warship or of commercial tonnage generally. One of the two British-African steamers now building at Barrow is ready for launching, and much progress has been made with the second. The Pacific liner *Orona* is also making progress, and although building material has been difficult to get hold of it is expected this ship will be ready for launching in the autumn of the present year. Barrow will, in fact, show a record of tonnage launched this year. Already the Clan liner *Clan Cuming*, of 7,000 tons, has been launched, and since then Sir William Wills' yacht of 580 tons. The *Clan Cuming* will be away from Barrow in a few weeks. Her sister ship, the *Clan Ferguson*, both being of the turtle-decked type, is already doing very good service, and this class of boat will probably in the future be much more largely built for ordinary commercial tonnage. Sir William Wills' new yacht will be ready for sea early in March. The first-class cruiser *Amphitrite* is so far completed as to be ready to leave Barrow on February 28th. She would have been completed long since if it had not been for the engineers' strike. She embraces many improvements over the *Niobe*, her sister ship built at Barrow, and the latter on her trials did some very excellent results. The torpedo-boat destroyers *Bittern*, *Avon* and *Leopard*, have practically completed their trials, and have easily maintained their high rate of speed at about 30 knots. The *Otter* is still on hand. Owing to the breaking of one of her shafts repairs are necessary, and it is believed when she is fitted with one of Vickers' shafts she will complete her trials as creditably as have her sister craft. Another of the Clan Line steamers is due at Barrow to undergo repairs and to have her engines tripled, and this will then be the last order in hand for the Clan Line. Never since Sir Charles Cayzer was member for Barrow has the Barrow yard been without an order of some sort for the Clan Line, of which he is the managing director. It is probable, however, that less work will come to Barrow from that source in the future now that the firm of Vickers are devoting themselves more particularly to Admiralty work. Yet it must not be forgotten Sir Charles Cayzer found the old Naval Construction Company plenty of work when orders were difficult to get, and should that position recur it is probable more work for the Clan Line will come to the Barrow yard. The question of the proposed new lock in the Ramsden Dock, Barrow, is an important one for the shipbuilding interest at Barrow, as means are required to get vessels of deeper draft into and out of the docks. This cannot be done at a less cost than probably £100,000, and as the provision of this dock would not only give better access to the docks for deep draft ships, but would act as a graving dock for the biggest vessels afloat as well, it is important to the shipbuilding trade it should be provided. This would mean the introduction of a large ship-repairing trade to Barrow. The new electric plant at the Barrow Shipyard has been inaugurated, and is doing very useful and satisfactory service, as well in the driving of machinery as in the provision of illumination. There is still a very large demand for new houses in Barrow, and some big sheme for providing say a thousand houses will probably be floated. Mr. A. Adamson, J.P., general manager of the Naval Construction Works, has purchased Croslands Mansion, near Furness Abbey, one of the finest and most pleasantly situated houses in the district.

West Cumberland.—The shipbuilding industry in the West Cumberland district is very busy, and builders are in no sense short of orders. They are, of course, mainly employed on small-tonnage craft, but they have plenty of work to do both at Messrs. Ritson's at Maryport and Messrs. Williamson's at Workington. The prospect of new orders is also an encouraging one, and there seems every reason to expect a continuance of the present state of activity. The yards in this district do not undertake the work of building engines and fitting up steamers complete. They generally arrange with Clyde engineers to do this work, but there is a big engineering shop at Lowea, near Workington, and it is probable, when better dock accommodation is provided on the Solway, vessels built here will be fully completed and made ready for trading. Another feature of some importance is to be found in the fact that one or more of the steel makers on this coast contemplate going into the manufacture of Siemen-Martin's steel. This would give an impetus to local shipbuilding enterprise.

Shipbuilding Material.—A very brisk and growing business is being done in the shipbuilding material trade, and the mills in the district are all very fully employed. Makers are, indeed, more crowded with orders than they have ever been, and the demand from all sources is of a very pressing character. This is particularly the case with regard to heavy steel plates, and indeed light plates as well. About 1,000 tons a week of plates are turned out at the Barrow Steel Works, and arrangements are in progress by means of which this output will be considerably increased. At present there is not enough furnace capacity to keep the mills in full employ, but this defect is being remedied, and in a short time several additional Seimen-Martin furnaces, capable of dealing with 50 tons at a time, in the bath will be in regular operation. These furnaces to some extent have to supply the metal required in the very large steel-casting department which exists at the Barrow works, a branch which is being very largely extended, owing to the growth of the trade, and the pressure there is in the demand, alike on the part of shipbuilders and engineers. It is quite on the cards that what is known as No. 3 rail mill at these works will probably soon be converted into an angle mill. There is a big trade doing in angle steel, and Barrow is admirably situated for the successful working of this trade, by reason of the fact that the raw material from which steel is made is found in abundance in Furness, while there is a good local demand for angles at small delivery cost, and cheap facilities for the delivery of steel angles to Belfast, the Clyde, the West Cumberland coast, the Thames, Hull, the North-east coast, and the dockyards. Indeed, a good business for plates, sections and other material has already been opened up with these places by Barrow makers, and indications are not wanting that still greater activity will be shown in this department in the early future. Prices are very firm at fuller rates. Heavy plates are quoted at £7 2s. 6d., and angles at £6 15s. Other descriptions of steel goods are in good demand, and prices are very firm, while orders are largely held in every department.

Hematites.—The hematite pig iron trade is very briskly employed, and the demand is still far in excess of the supply. This results in a high rate of prices. Values have fluctuated somewhat during the month, but the tendency after every depression has been in the direction of increased prices. Makers quote 61s. to 62s. per ton for mixed Bessemer, Nos. net, f.o.b., and warrant iron is selling at 62s. 2d. net cash, buyers offering 60s. 1½d. Stocks have further increased in warrant stores during the month, and are now at 198,000 tons. Makers hold very little stock beyond what they require for steel conversion purposes. They have forty furnaces in blast, as compared with forty-one at the corresponding period of last year, but these are on the point of being increased within a few days. The chief feature of the production of iron is of Bessemer quality, and very little of the commoner iron is now being made.

Shipping.—The shipping trade is very briskly employed. During the year so far 48,593 tons of pig iron and 64,856 tons of steel have been exported from West Coast ports, as compared with 61,068 tons of pig iron, and 77,700 tons of steel in the corresponding period of last year, showing a decrease of 12,475 tons of iron, and 12,844 tons of steel. Freights are at good prices, and there is plenty of employment for coastwise and foreign ships.

Wailes, Dove & Company.—I understand that Wailes, Dove & Co., the proprietors of the well-known "Bitumastic" patents, are about to turn their firm into a limited liability company, principally for family reasons. Although their company is to be a private one, friends of the firm will probably have an opportunity of taking some interest in it. This firm have booked some very large orders recently on the North-East Coast, the Clyde, and the Continent, including work for such lines as the Cunard, American, Pacific, Royal Mail, Royal Hungarian, Hamburg, American, and others for the most influential shipping companies at home and abroad.

The Inadsuma, the second of six torpedo-boat destroyers being constructed for the Imperial Japanese Government by Messrs. Yarrow & Co., Limited, was successfully launched at the works of the builders at Poplar, on Saturday afternoon, January 28th, in the presence of Admiral Matsunaga, Inspector-General for the Japanese Navy, Constructor Captain Kurobe, Constructor Commander Kondo, and other Japanese officials. The guaranteed speed is 31 knots on a three hours' run, carrying 35 tons.

LAUNCHES AND TRIAL TRIPS.

LAUNCHES—English.

Sir Perceval.—On January 11th there was launched at North Shields, for Grimsby owners, a steel steam ketch of about 153 tons gross, named the *Sir Perceval.*

Voorwaarts.—On January 12th there was launched at North Shields, for Vlaardingen owners, a steel steam ketch of about 153 tons gross, named the *Voorwaarts.*

General Gordon.—On January 17th there was launched at Hull, for the Yorkshire Steam Fishing Company, of Hull, an iron steam ketch, of about 200 tons, named the *General Gordon.*

St. Louis and St. Paul.—On January 18th there was launched at Hull, for the Victor Steam Fishing Company, Limited, of Grimsby, two steel steam ketches of about 191 tons gross each, named the *St. Louis* and *St. Paul.*

Clan Cuming.—On January 26th, Messrs. Vickers, Sons and Maxim launched the steamer *Clan Cuming* from their Barrow yard. She is a turret-decked steamer, to carry, 7,000 tons. Sir Charles Cayzer said this type of cargo steamer would probably be the accepted style of cargo boats for the future, as they combined good sea qualities with great carrying capacity. The Clan Line had already seven of these steamers, and nine others were building.

Lee (H.M.S.).—On January 27th there was launched by Messrs. W. Doxford & Sons (Limited), at Pallion, the fifth torpedo boat destroyer they have built for the British Government. The vessel's displacement is about 340 tons, her speed will be 30 knots, and her I.H.P. 6,500.

Cardiganshire.—On January 27th there was launched from the yard of the Sunderland Shipbuilding Co., Limited, a handsome screw steamer, built to the order of Messrs. Jenkins & Co., of London, for their "Shire" line of steamers. The length of the vessel is 356 ft.; breadth 45 ft. 2 in.; and depth, moulded, 29 ft. 4 in., having large topgallant forecastle, in which are berthed the sailors and firemen, long bridge amidships, on the top of which is provided accommodation for captain, engineers, officers, and a few passengers. The handsome saloon is tastefully fitted in polished oak, with tiled floor, and complete with every comfort. The full poop is entirely devoted to cargo. The vessel is constructed on the deep-frame principle, thus dispensing with hold beams, and has cellular water ballast all fore-and-aft. The poop, bridge, and forecastle decks are of wood, the main and spar decks of steel. Her class will be 100 A1 Lloyd's, spar deck grade, special survey, also Board of Trade certificate; her deadweight carrying capacity is 6,000 tons. The deck machinery consists of eight large steam winches by Mr. R. Welford, of Pallion, and direct steam windlass by Messrs. Emerson, Walker & Thompson, Alley & McLellan's steam steering gear, which is placed in the engine-room, and worked from flying-bridge, together with all the usual appliances for handling cargo and working the ship with the greatest possible despatch. The main engines are upon the tri-compound principle, by the North-Eastern Marine Engineering Co., Limited, Sunderland, and have cylinders 24 in., 40 in., and 64 in. by 42 in. stroke, steam being supplied by two large steel boilers working at a pressure of 170 lbs. per square inch. During construction the steamer has been inspected, on behalf of the owners, by Mr. C. E. Hudson, and upon leaving the ways was gracefully named *Cardiganshire* by Mrs. Montefiore, sister of the senior partner, after which she was towed into the South Dock for the purpose of masting and for shipment of her machinery.

Mundaka.—On Friday, January 27th, Messrs. Wm. Gray & Co., Limited, launched the fine steel screw steamer *Mundaka.* She is of the following dimensions, viz.:—Length over all, 300 ft.; breadth, 42 ft.; depth, 20 ft. 2¼ in., and has been built to the order of Raman-de-la-Sota, of Bilbao. She will take Lloyd's highest class, and is of the partial awning deck type with the saloon and accommodation for captain and officers in the poop, the engineers' berths amidships, and the crew's accommodation forward. The vessel is built on the web frame system, with cellular double bottom for water ballast and after peak ballast tanks, steam winches, donkey boiler, steam steering gear amidships, screw gear aft, steam windlass, schooner rig with patent folding masts, boats on beams overhead, and generally equipped in a first-rate manner for a cargo steamer. The engines are of the triple-expansion type working on three cranks. They are supplied by the Central Marine Engineering Works of William Gray & Co., Limited. The cylinders are 23 in., 36½ in., and 62 in. diameter, and the piston stroke 39 in., with two large steel boilers to work at a pressure of 160 lbs. per square inch. The vessel has been built under the superintendence of Captain Ricardo De Goicoechea, on behalf of the owners, and the ceremony of naming her *Mundaka* was gracefully performed by Miss Clarkson, of West Hartlepool.

Solo.—On Friday, January 27th, the s.s. *Solo*, which is being constructed to the order of the Rotterdamsche Lloyd of Rotterdam, was launched from the Neptune Works of Wigham, Richardson & Co. The vessel is built of steel, to the highest class in the Registry of the Bureau Veritas. She is 333 ft. long by 44 ft. beam by 31 ft. depth, and will have accommodation for a limited number of passengers. The engines and boilers, which are designed to drive the vessel at a good speed, are also being constructed by Messrs. Wigham, Richardson & Co. The construction of the vessel is proceeding under the superintendence of Mr. J. de Bruyn Kops, naval architect of the Hague, who was present at the launch, and that of the engines of Mr. Atkins, of Rotterdam. The owners were represented by Mr. A. Ruys, and the christening ceremony was gracefully performed by Miss Lydia C. Stephens, of Corbridge-on-Tyne.

Euscinia.—On Saturday, January 28th, there was launched from the yard of the Tyne Iron Shipbuilding Co., Limited, of Willington Quay-on-Tyne, a steel screw steamer to the order of Messrs. Hecksher & Co., of Copenhagen, and of the following dimensions, viz.:—Length, 348 ft.; breadth, 48 ft.; depth, 27 ft., and to class 100 A1 at Lloyd's on the spar decked rule. This vessel has water ballast fitted fore and aft on the cellular system, and is also fitted with all modern improvements for the rapid loading and discharging of cargo, including seven double cylindered steam winches, direct acting steam windlass, large donkey boiler, steam steering gear by Messrs. Donkin & Co., and Hastie's screw gear aft. The engines, which are to be supplied by Messrs. Blair & Co., Limited, of Stockton, are of the triple-expansion type, having cylinders 24 in., 40 in., and 66 in. by 45 in. stroke, and working at a pressure of 180 lbs. On leaving the ways the vessel was named the *Euscinia* by Miss Lilian Bone, of Tynemouth.

Moorabool.—On January 30th there was launched from the shipbuilding and repairing works of the Blyth Shipbuilding Co., Limited, of Blyth, a steel screw steamer for Messrs. Huddart, Parker & Co., Limited, of Melbourne. The principal dimensions of the vessel are:—Length, 337 ft.; breadth, 47 ft.; depth, 24 ft. 10 in., and she is designed to carry a large cargo on a light draught of water. She is classed 100 A1 at Lloyd's, and is built on the three-deck principle with single deck laid, deep framing, and has bridge amidships, with house on top for cabin accommodation. The engines will be supplied and fitted by Messrs. Blair & Co., Limited, of Stockton-on-Tees, and are of the triple-expansion type of large power, to pass Lloyd's and Board of Trade regulations. The ceremony of naming her *Moorabool* was gracefully performed by Mrs. W. Cumming, wife of the superintendent of the company.

Raithwaite.—On Saturday, January 28th, Messrs. Wm. Gray & Co., Limited, launched the large steel screw steamer *Raithwaite* built to the order of Messrs. The Pyman Steamship Co., Limited, West Hartlepool. The vessel is built to Lloyd's 100 A1 class under special survey, and her dimensions are, viz., length over all, 341 ft., breadth 47 ft., and depth 24 ft. 10 in. The deck erections consist of a full poop, long bridge, and topgallant forecastle. The saloon and captain's and officers' rooms will be fitted in a large deckhouse on the bridge, and the engineers' rooms are also on the bridge. The hull is built with deep frames and cellular double-bottom for water ballast, powerful steam winches, steam-steering gear amidships, and screw gear aft, patent direct steam windlass, two donkey boilers, grain divisions, stockless anchors, and a complete outfit, will be fitted for a first-class cargo-boat. Three cylinder triple-expansion engines are being supplied by the Central Marine Engine Works of Messrs. Wm. Gray & Co., Limited, they will develop over 1,200 H.P. The cylinders are 24 in., 38 in. and 64 in. diameter, with a piston stroke of 42 in., and large steel boilers constructed for a working pressure of 160 lbs. per square inch. The hull and machinery have been built under the superintendence of Mr. Cromar, on behalf of the owners, and the ceremony of christening the steamer *Raithwaite* was gracefully performed by Miss Ella Smyth, Waverley, West Hartlepool.

Sborg.—On Monday, January 30th, Messrs. Short Bros. launched from their shipbuilding yard at Pallion a handsomely-modelled steel screw steamer, built to the order of C. K. Hansen, Esq., of Copenhagen. The vessel has been built under special survey to the highest class in Lloyd's Register, and is of the following dimensions, viz.:—Length 286 ft.; breadth 43 ft.; and depth, moulded, 21 ft. The vessel is fitted with a full poop, long bridge amidships, on which houses are fitted up for the accommodation of captain and officers, and topgallant forecastle for crew. There are four large hatchways with a powerful steam winch at each, steam being supplied to the latter by a large multitubular donkey boiler placed in the stokehold. The double bottom which is on the cellular principal is subdivided into trimming tanks for water ballast. On leaving the ways the vessel was named *Sborg* the ceremony being gracefully performed by Miss Short, of Ashbrooke Hall. The vessel is to be fitted with engines by Messrs. George Clark, Limited, of Sunderland, having cylinders 21 in., 35 in. and 57½ in., with a stroke of 39 in., and having two large steel boilers working at a pressure of 160 lbs. The construction of the vessel has been under the supervision of Captain Fischer on behalf of the owners.

Cephalonia and Buckingham.—On January 31st Messrs. Cochrane & Cooper, Limited, launched from their Grovehill Shipyard, Beverley, two steam trawlers. The s.s. *Cephalonia* is 115 ft. by 21 ft., by 11 ft. 3 in. depth of hold, built to the order of Messrs. E. J. Williams & Co., Hull; triple-expansion engines will be supplied by Messrs. John Cran & Co., Leith, and the vessel will be fitted ready for sea with all the latest appliances for trawling. The s.s. *Buckingham*, 100 ft. by 21 ft. by 11 ft. depth of hold, is an addition to the fleet of the Queen Steam Fishing Co., Limited, Grimsby, Messrs. C. D. Holmes & Co., Hull, are supplying triple-expansion engines and the vessel will be complete with all the requisite fittings of a first-class trawler. The former vessel was named by Mrs. Warrent, of Hull, and the latter by Mrs. C. A. Osborne, Grimsby. After the ceremony the company adjourned to the Beverley Arms for luncheon.

Volta. — On February 1st Messrs. Cochrane & Cooper launched, from their new shipbuilding yard at Selby, the steam trawler *Volta*, of the following dimensions, 102 ft. by 20 ft. 6 in. by 11 ft. depth of hold, built for Mr. P. Hancock, of Milford Haven. The christening ceremony was performed by Lady Raincliffe.

Bolama.—On February 2nd Earle's Shipbuilding and Engineering Co., Limited, of Hull, launched the s.s. *Bolama* a smart single-screw steamer which they have built to the order of T. C. Laws, Esq., of Liverpool,, for the Empreza Nacionale, of Lisbon. She is 200 ft. long; 30 ft. beam; and 15 ft. 6 in. moulded depth; is arranged with poop, bridge and topgallant forecastle, whose decks are of teak, and she will have accommodation for first-class passengers under the bridge, for second-class aft, and for third-class under main deck forward. She will be fore-and-aft rigged and will have a complete electric light installation. Her engines are of the three-crank type, with cylinders 18 in., 27 in., and 48 in. diameter, by 27 in. stroke, and the boilers are two in number of the single-ended pattern, made for 180 lbs. working pressure, and will be provided with feed heater and evaporator.

Steamer.—On February 2nd there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel barge of the following dimensions:—Length, overall, 68 ft. 6 in.; breadth moulded, 13 ft. 2 in.; depth, amidships, 5 ft. 2 in., and with a carrying capacity of 70 tons. She was built to the order of Messrs. Wm. Cory & Sons, Limited, Erith, Kent, and is the fifth of an order for six. On leaving the ways she was christened *Steamer* by Miss May Ounsworth, of Iver.

Bardsey.—On Wednesday afternoon, February 8th, Messrs. Richardson, Duck & Co. launched from their yard a steel screw steamer of the following dimensions, viz.:—Length overall, 350 ft.; breadth extreme, 46 ft.; depth moulded, 27 ft. 3 in. This vessel, which is the thirteenth Messrs. Richardson, Duck & Co. have built to the order of Messrs. Farrar, Groves & Co., of London, will class 100 A1 in Lloyd's register, and has been built under special survey. She is of the three-deck type with one deck laid with poop, bridge and topgallant forecastle. Accommodation for captain and officers is provided in a large deckhouse on bridge, engineers being berthed in bridge 'tween decks at after end and crew in topgallant forecastle. A cellular double bottom and fore and after peak tanks are fitted for water ballast. Equipment includes eight steam winches, large horizontal donkey boiler by Messrs. Blair & Co., steam windlass, stockless anchors, steam steering gear, double derricks to two hatches, &c., &c. The engines by Messrs. Blair & Co. have cylinders 24½ in., 40½ in., and 66½ in. by 42 in. stroke, steam being supplied by two single ended boilers having a working pressure of 160 lbs. As the vessel left the ways she was christened *Bardsey* by Mrs. H. G. Spence-Elmwood Hartburn, Stockton.

Hatasu.—On Wednesday, February 8th, Messrs. Furness, Withy & Co., Limited, launched from their Middleton Shipyard, Hartlepool, a large steel screw steamer to the order of Messrs. H. B. & A. Gourlay, London. She is nearly 350 feet in length, and built throughout of Siemens-Martin steel, with large measurement and deadweight carrying capacity of about 5,500 tons. The vessel is of the single-deck type, with poop, bridge and forecastle, and takes Lloyd's highest class. The holds are fitted with iron grain divisions and all deck erections, skylights, bulwarks, &c., are constructed of steel and iron; cellular double bottom all fore and aft for water ballast, the after peak being also available as a tank. Six large and powerful steam winches, donkey boiler, patent steam steering gear amidships, screw gear aft, direct steam patent windlass, double derricks, stockless anchors hauling into hawse pipes and other modern appliances are fitted for the handy working of the ship. The saloon and cabin, providing accommodation for the captain, &c., is handsomely finished in polished hardwood. The vessel will be rigged as a two-masted fore and aft schooner, and fitted with triple expansion engines by Messrs. T. Richardson & Sons, Limited, Hartlepool. The vessel has been constructed under the supervision of Mr. M. Havelock, on behalf of the owners. On leaving the ways the ceremony of christening the vessel *Hatasu* was gracefully performed by Miss Vick, daughter of one of the builders.

Grecian Prince.—On February 9th there was launched at South Shields for Mr. W. H. Storey, of North Shields, a steel steamer, named the *Grecian Prince*.

Hyanthes.—On February 9th Messrs. Bartram & Sons launched at Sunderland a large steel screw steamer for Messrs. R. P. Houston & Co., Liverpool. She is intended for their River Plate Line, and has been specially designed by the senior partner, Mr. R. P. Houston, M.P., for the various requirements of the Plate trade. The vessel is of the following dimensions:—Length, 365 ft.; breadth, 47 ft.; depth, 27 ft. 6 in.; and has been built under special survey to take the highest class in Lloyd's Registry. The engines will be supplied by Messrs. John Dickinson & Sons, Limited, the cylinders being 26 in., 43½ in., and 72½ in. by 48 in. stroke. There are three large steel boilers to work at 180 lb. pressure. The vessel was christened *Hyanthes*.

Anna.—On Thursday afternoon, February 9th, Messrs. Craig, Taylor & Co. launched from their Thornaby Shipbuilding Yard, Thornaby-on-Tees, a handsomely modelled steel screw steamer of the single deck type, and of the following dimensions, viz., 299 ft. by 43 ft. by 21 ft. 3 in. moulded. She has been built to the highest class in Lloyd's, and her deck erections consist of poop, bridge and forecastle, the accommodation being in large deckhouse on bridge. She has deep frames throughout, giving her clear holds for stowing cargo, and she is also fitted for water ballast on the double cellular principle. The vessel will be equipped with four double powered steam winches, patent steam steering gear, patent steam windlass, stockless anchors, large donkey boiler, screw gear aft, and all modern improvements for economical working. The engines, by Messrs. Thomas Richardson & Sons, Limited, Hartlepool, are 22 in., 35 in., 59 in. by 39 in., with two large boilers. The vessel has been built for Messrs. Fratelli, Cosulich & Co., Trieste, and under the superintendence of Captain Antonio N. Cosulich. As the vessel left the ways she was gracefully christened the *Anna* by Miss Craig, daughter of one of the builders.

Semantha.—On February 10th Messrs. Austin & Son, Limited launched at Sunderland the steel screw steamer *Semantha*, which has been built to the order of Messrs. John R. Haws & Co., of Liverpool. This vessel is built of steel to class 100 A 1 under special survey of Lloyd's Register, her dimensions being as follows:—Length over all, 333 ft. 6 in., breadth, extreme, 46 ft. 9 in.; depth, moulded, 23 ft. 9 in.; and she is estimated to carry a total deadweight of 4,700 tons. Machinery of the triple-expansion type, with large boilers working at a pressure of 100 lbs. per square in. will be supplied by Messrs. John Dickinson & Sons, Limited, of Sunderland.

Ravenshoe.—On February 11th the first launch took place from the newly-established Northumberland Shipbuilding Company's yard at Howdon-on-Tyne. The steamer is a cargo carrier, designed to carry 6,000 tons deadweight, and has been built for one of the directors of the company, Mr. John Cory, of Cardiff. The principal dimensions are:—352 ft. over all, by 48 ft. beam, and a depth of 27 ft. 4 in. She is specially designed to meet the coal-carrying requirements of Cardiff. Her propelling machinery has been constructed by Messrs. Thomas Richardson & Sons, of Hartlepool, and has cylinders 24, 39, and 60 ins. diameter, by 45 in. stroke, supplied with steam by two boilers, 16 ft. by 10 ft. 6 in. long. The christening ceremony was performed by Mrs. Rowland Hodge, wife of the managing director of the company, who named the vessel *Ravenshoe*.

Sabrina.—On Saturday, February 11th, Messrs. Vickers, Sons & Maxim launched from their yard at Barrow the steam yacht *Sabrina*, which they are building for Sir William H. Wills, Bart., M.P. The vessel was named by Mrs. St. Clare J. Bryne, wife of Mr. St. Clare J. Bryne, naval architect, of Liverpool, to whose design and under whose superintendence the yacht is being built. The vessel is 165 ft. 6 in. long on load-water line, her breadth being 25 ft. 2 in.; depth, moulded, 15 ft. 6 in., and displacement 580 tons. She is built to the requirements of Lloyd's highest yacht class under special survey. She is provided with owner's state-room, and dining-room below, a deck saloon before the funnel, and numerous state rooms. She will be rigged with two masts, having fore and aft sails. She will be propelled by triple-expansion engines capable of a speed of 14 knots, the high-pressure cylinder having a diameter of 14 in., the intermediate 22 in., and the low-pressure 36 in., all having a stroke of 27 in. The steam pressure is 175 lbs. The machinery throughout is of the highest class, both in regard to design and finish, and embodies all the latest and best improvements to be found in first-class yachts.

King Egbert.—On February 13th there was launched at Grimsby by Messrs. Hagerup, Doughty & Schofield for Grimsby owners a steam trawler, 104 ft. long between perpendiculars, 21 ft. broad, and 12 ft. deep to the top of keel. She was christened the *King Egbert*.

Montfort.—On February 13th there was launched from the Jarrow yard of Messrs. Palmer's Shipbuilding and Iron Co., Limited, a finely-modelled steel twin-screw steamer, of the following dimensions:—Length between perpendiculars, 445 ft.; breadth, extreme, 52 ft.; depth, moulded, 30 ft. 10 in. The vessel is rigged as a four-masted fore-and-aft schooner, and has been built under special survey, to take the highest class in Lloyd's Registry. She is of the three-decked type, with two steel decks laid all fore-and-aft, and has an iron shelter deck specially strengthened for the Atlantic trade, extending over the whole length, and above this is a shade deck, covering the machinery openings. All the available space under the shelter deck, and along each side under the shade deck, is fitted throughout with the most improved and modern arrangements for carrying cattle. Accommodation for the officers and engineers is arranged on the shade deck in large steel houses, and for the seamen, firemen, and cattlemen forward. A cellular double bottom is fitted all fore-and-aft, and is arranged for carrying water ballast, and also for fresh water for supplying cattle. Water ballast is arranged to be carried in a deep cargo tank and in the after peak, giving the vessel a total water ballast capacity of over 2,000 tons. She is designed to carry about 8,000 tons deadweight on a mean draft of 25 ft. The vessel is divided into eight water-tight compartments by means of seven steel bulkheads, all of which extend to the upper deck. Each cargo compartment is fitted with a complete set of grain division boards, extra large cowl ventilators, and all other requirements for the safe carriage of grain or other cargoes, and a complete system of hatches, winches, and derricks are provided for the rapid loading and discharging of cargoes. Aft of the engine-room the 'tween decks are insulated and fitted with the necessary refrigerating plant for carrying about 500 tons of cargo. A powerful steam windlass is fitted forward for working the cables, and a combined hand and steam screw-steering gear of special design is fitted in a large steel wheel-house on the after end of the shelter deck. The vessel is lighted throughout by electricity, and will be fitted and finished as a first-class cattle and cargo steamer, including all the most modern improvements for the Atlantic trade. The engines, which are twin-screw, are also being constructed by the Palmer Co. They are of the inverted triple-expansion type, each set having cylinders 26 in., 43 in., and 70 in. by 45 in. stroke, steam being supplied by three double-ended boilers 14 ft. 6 in. in diameter by 17 ft. 6 in. long, with a working pressure of 180 lbs. As the vessel left the ways she was christened *Montfort* by Mrs. Malcolm Dillon, wife of the secretary of Palmer's Co. The company afterwards adjourned to the model-room, where the usual congratulatory toasts were proposed by Mr. A. M. Palmer and duly honoured. The *Montfort* is a sister ship of the *Monteagle*, and is the fourth steamer built by Palmer's Co. for Messrs. Elder, Dempster & Co., of Liverpool.

Trawler.—On February 18th there was launched from the yard of Mr. Joseph Scarr, Grovehill, Beverley, a steel barge of the following dimensions:—Length over all, 68 ft. 6 in.; beam, moulded, 13 ft. 2 in.; depth amidships, 5 ft. 2 in.; and with a carrying capacity of 70 tons. She was built to the order of Messrs. Wm. Cory & Sons, of Kent, and is the last of an order for six. She was christened *Trawler* by Miss May Ounsworth, of Iver.

Wilberforce.—On February 18th this vessel was successfully launched by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, and has been built to the order of Mr. John H. Harrowing, C.C., J.P., of Whitby. This is the second vessel built by these builders for Mr. Harrowing, and the fourth built for Mr. Harrowing's family. It is an interesting fact that this is the thirty-sixth vessel built by this firm for Whitby owners. The principal dimensions of the *Wilberforce* are:—Length, 336 ft.; breadth, 45 ft. 6 in.; depth, 26 ft. 4 in. She is built to Lloyd's highest class on the three-deck rules, with only one deck laid. The holds are left clear for cargo, also the poop and bridge. The whole of the accommodation for the officers, engineers, captain, and saloon being in a house on the top of the bridge; there is a large chart and steering-house fitted on top of the saloon-house; the crew, firemen, and petty officers being berthed in the topgallant forecastle. The vessel is built on the web frame and longitudinal intercostal system. She has a cellular double bottom right fore and aft for water ballast, the after peak being also fitted to carry water ballast. She has six transverse water-tight bulkheads, and the holds are divided longitudinally by shifting boards. The appliances for the rapid handling of cargo are of the most modern and powerful description. A large steam winch is fitted to each cargo hatchway, with the usual derricks, &c. A patent steam windlass is fitted on the forecastle head. A steam steering gear is fitted in the aft end of the casings, connected by controlling gear with the forward bridge, while a patent screw gear is fitted aft. The deck machinery is worked by a patent donkey boiler. The vessel is rigged as a two-masted fore-and-aft schooner, and four boats are fitted on the bridge. Altogether the vessel is a complete specimen of the modern cargo boat. The engines and boilers have been constructed by Messrs. Geo. Clark, Limited, Sunderland, the sizes of the cylinders being 23 in., 38 in., and 62 in. by 42 in. stroke, steam being supplied by multitubular boilers working at 160 lbs. pressure. There was a numerous company present at the launch, including Miss Iris Harrowing, who gracefully launched the vessel, and Mrs. John H. Harrowing, wife of the managing owner, who launched the vessel by hydraulic power. The hydraulic apparatus used at the launch is the same as has been used for launching over eighty vessels since 1892, when a patent was taken out for it by Mr. P. Phorson, works manager. After the launch the company adjourned to the firm's luncheon room, where the usual toasts were duly honoured.

Spennymoor.—Lately there has been launched from Messrs. John Blumer & Co.'s shipyard, Sunderland, a screw steamer built to the order of Messrs. Walter Runciman & Co., Newcastle and London, of the following dimensions:—319 ft. 6 in. by 46 ft. by 23 ft. 6 in. She will be fitted with engines by Messrs. John Dickinson & Sons, Limited, with cylinders 23 in., 38 in., and 62 in., by 42 in. stroke, with two large boilers working at 160 lbs. pressure. The steamer was named *Spennymoor*, by Miss Rena Runciman, niece of the senior partner of the firm.

LAUNCHES—Scotch.

Nyassa.—On January 26th Messrs. John Reid & Co., Limited, Whiteinch, launched the s.s. *Nyassa* of about 4 700 tons capacity, which is the latest addition to Messrs. Maclay & McIntyre's large fleet of steamers. This vessel will be supplied with machinery by Messrs. D. & W. Henderson & Co. The *Nyassa* is a sister ship to the *Fashoda* which Messrs. Reid & Co. completed a few months ago for the same owners.

Cato.—On January 26th the Campbeltown Shipbuilding Co., launched from their yard at Trench Point a steel screw steamer of 2,000 tons deadweight for the Bristol Steam Navigation Co. The vessel has been built to the highest class at Lloyd's, and is intended for Continental trading. She will be engined at Greenock by Messrs. Kincaid & Co. On leaving the ways the steamer was named *Cato* by Miss Mackay Greystone.

Eastern.—On January 26th Messrs. R. Napier & Sons, Limited, launched from their shipbuilding yard at Govan a steel screw steamer of about 3,400 tons for the Eastern and Australian Steamship Co., London. This steamer has been specially designed to meet the requirements of the company's service between Australia, China, and Japan, and is built under special survey to Lloyd's highest class, and fitted in accordance with the Board of Trade regulations. The general dimensions are:—Length, 340 ft.; breadth, 42 ft.; depth, 30 ft; with a topgallant forecastle, long bridge, full poop, and shade deck amidships; the most modern appliances have been supplied for the efficient working of the ship and cargo, including a complete installation of electric lighting, refrigerating plant, &c. Luxurious accommodation has been provided before the machinery for 50 first-class passengers, and as the steamer is intended to trade in tropical climates, the dining saloon, music-room, and smoking-room have been placed on the bridge-deck; the large and roomy state-rooms are on the upper deck, which admits of perfect ventilation, and are fitted with the most recent improvements for the comfort of the passengers. The second-class accommodation (scarcely inferior to the first) is in the poop, and spacious quarters for emigrants in the 'tween decks. On leaving the ways the vessel was named *Eastern* by Mrs. James Hamilton. After a very successful launch the steamer was towed up the harbour to receive her machinery, which has been constructed at the builders' Lancefield Works.

Waddon.—On January 26th Messrs. William Hamilton & Co. launched from their Glen Yard, Port-Glasgow, a steel screw steamer of about 2,100 tons net register, and to carry 5,400 tons deadweight, for Messrs. Houlder, Middleton & Co., 7 & 8, Great St. Helens, London. The vessel has been specially built for their Eastern trade. The following are the principal dimensions:—Length, b.p., 330 ft.; breadth, 45 ft. 6 in.; depth, moulded, 26 ft. 6 in. The vessel has been built to the highest class at Lloyd's, on the deep frame system, and is fitted throughout with a double cellular bottom for water ballast, the after peak being utilised for this. All the newest requirements for the quick loading and discharging and working of the ship have been supplied. Shifting boards can be fitted, and the hatchways are arranged to act as feeders when carrying grain in bulk. The accommodation for the officers and crew is of the most complete description; the saloon, captain's room, and two spare state-rooms being in large deckhouse on bridge deck. The officers and engineers rooms are placed alongside engine casing, and are replete with every comfort, while the crew are berthed under the topgallant forecastle. The machinery, which is being supplied by Messrs. David Rowan & Son, Glasgow, is on the triple-expansion principle. The cylinders are 24 in., 40 in., and 65 in. diameter by 42 in. stroke, steam being supplied by two large boilers working at 180 lbs. pressure. As the vessel left the ways she was gracefully named the *Waddon* by Mrs. John Malcolm, Granby Terrace, Glasgow. Immediately after the launch, which was most successful, the vessel was towed to Glasgow to receive her machinery.

Sandormen.—On January 27th Messrs. Wm. Simons & Co., Limited, launched complete from their yard at Renfrew, with steam up ready for sea, the hopper dredger *Sandormen*, which they have constructed to the order of the Royal Danish Government. The *Sandormen* is fitted with one pair of compound surface-condensing engines and mild steel boiler for 120 lbs. working pressure. Independent steam hoist gear is provided for manipulating the bucket ladder and independent steam mooring winches are fitted at bow and stern. The dredging gear is so arranged that the dredger can cut its own flotation through banks and shoals. Ample accommodation is provided for the officers and crew. The *Sandormen* is classed at Bureau Veritas, and is the second dredger constructed by Wm. Simons & Co., Limited, for the Royal Danish Government.

Honorius.—On January 28th Messrs. Archd. McMillan & Son, Limited, shipbuilders, Dumbarton, launched the steel screw steamer *Honorius*, the first of two vessels building by them to the order of Messrs. R. P. Houston & Co., Liverpool. The dimensions are 362 ft. by 47 ft. by 27 ft. 6 in., and a complete shelter-deck is fitted over the upper deck. On top of shelter-deck accommodation is provided in large deck houses for captain, officers, engineers, and a few passengers, while under the deck the crew are accommodated forward, and cattlemen, &c., aft. Three decks will be completely fitted up for cattle, while the water service, condensing apparatus, and ventilation in this connection are of the most perfect description. Water ballast is provided for in cellular double-bottom, which is subdivided so as to give storage room for fresh water for cattle and boilers. All latest improvements have been introduced for the speedy loading and discharging of cargo, and altogether the vessel will be fitted out in a very superior manner. The engines are triple-expansion, having cylinders 26 in., 43½ in., 72½ in. by 48 in. stroke, with three large single-ended boilers. The vessel is intended for the River Plate service, with which the owners have had long connection, and as Mr. Houston has designed the vessel to meet the special requirements of this trade, the *Honorius* should prove a valuable addition to the fleet of vessels already in Messrs. Houston's service. The vessel and machinery have been built to Lloyd's highest class and under the supervision of Mr. Wm. McLaren and Captain Hopkins, the company's superintendents. The christening ceremony was gracefully performed by Miss Bessie Donald, Hillhead, Glasgow.

Colombia.—On January 28th Messrs. Caird & Co. launched at Greenock, for the Pacific Steam Navigation Company, the steel twin-screw steamer Colombia. The new vessel is about 3,500 tons gross, and of the following dimensions:—Length, 359 ft.; breadth, 43 ft.; and depth, 22 ft. 6 in. The Colombia was towed to the Victoria Harbour, where her engines and machinery will be put on board by the builders.

Dungoyn and Dunsyre.—On January 28th Messrs. J. M'Arthur & Co., Paisley, launched two steel screw steamers, named the Dungoyn and Dunsyre, which, with other two steamers recently completed, have been built to the order of Messrs. Paton and Hendry, of Glasgow. These steamers have been specially designed and built for the coasting trade, and are built in excess of Lloyd's 100 A 1 requirements to permit of loading and discharging on ground. Compound surface-condensing engines are being fitted by Messrs. Bow, M'Lachlan & Co., Paisley.

Himitangi.—On January 28th there was launched by Messrs. John Fullerton & Co., at Paisley, to the order of Messrs. Levin and Co., Limited, Wellington, N.Z., for that firm's passenger and cargo traffic in New Zealand, a steel screw steamer of about 350 tons gross measurement. Triple-expansion engines are being supplied by Messrs. Muir and Houston, Limited, Glasgow. The steamer was named Himitangi by Mrs. William Signal, wife of Mr. William Signal, engineer, Wellington, N.Z., one of the owners.

Ladye Gipsey.—On January 30th, Messrs. Ramage & Ferguson, Limited, Leith, launched a finely-modelled full-powered steam yacht, built to the order of Thomas Pink, Esq., Thornton House, Clapham Park, from the designs of Dixon Kemp, Esq., London. The dimensions are—length, 168 ft. 6 in., by 22 ft., by 16 ft. 6 in. moulded, and triple-expansion engines with cylinders 18 in., 30 in., and 48 in. diameter by 32 in. stroke, supplied with steam from two large boilers working at 180 lbs. pressure, and, in addition, forced draught. The yacht is schooner-rigged, and has accommodation of a most luxurious nature, the dining-room being in a large deckhouse, with staterooms, drawing-rooms, and other rooms below. Steam and hand steering-gear, steam windlass, steam capstan, very full installation of electric light, powerful projector, donkey boiler, ventilating fan driven by electric motor, and all the most modern equipment for a first class yacht, have been fitted, and she will doubtless prove a marked addition to the yachting fleet. On leaving the ways the yacht was named *Ladye Gipsey* by Mrs. Pink; and afterwards the builders entertained a large company to cake and wine, when the toasts usual on such occasions were duly honoured.

Gairloch.—On January 31st Messrs. Charles Connell & Co. launched from their Scotstoun shipbuilding yard, Whiteinch, a steel screw steamer for Messrs. James Gardiner & Co., of

Glasgow. The dimensions are:—Length, 354 ft.; breadth, 45 ft.; depth, 28 ft. 6 in., with a gross tonnage of about 3,800 tons, and deadweight carrying capacity of 6,000 tons. She has been built to Lloyd's highest class, with cellular double bottom right fore and aft, and is fully equipped with all the most modern appliances for the safety and efficient working of the vessel. The machinery is being fitted by Messrs. Dunsmuir & Jackson, Govan. As she left the ways she was named *Gairloch* in the customary manner by Mrs. Spencer, of Glasgow.

Spithead.—On January 31st the London and Glasgow Engineering and Iron Shipbuilding Company, Limited, launched from their yard at Govan the second of two large steel screw-steamers built by them for the Clyde Shipping Company, Limited, for their Eastern trade. The dimensions are:—416 feet over all, 48 feet broad, and 31 feet depth moulded. She is designed to carry from 7,000 to 7,500 tons dead-weight, and the gross tonnage is about 4,750 tons. The vessel has been built to the highest class in the British Corporation, and is much in excess of the rules. The hold capacity is between 9,000 and 10,000 tons at 40 cubic feet per ton, and in addition to this there is bunker capacity of about 600 tons. The engines, which are supplied by the builders, are triple-expansion. The diameters of the cylinders are—h.p. 27 in., i.p. 42 in., l.p. 69 in. by 4 ft. 6 in. stroke, and the fittings embrace all the latest improvements. There are two single-ended boilers, 15 ft. 9 in. mean diameter by 12 ft. 6 in. long, arranged to work with Howden's system of forced draught. The working pressure is 160 lb. per square inch. In addition there is an auxiliary boiler for supplying steam to the winches and electric light engines, &c. As the vessel left the ways she was gracefully named the *Spithead* by Mrs. Maurice Portal, Hexham, Northumberland, daughter of the chairman of the Clyde Shipping Company, Limited.

Indian.—On February 7th Messrs. John Duthie, Sons & Co. launched at Aberdeen, a finely-modelled steam trawler, with a gross tonnage of 180, for the Great Grimsby and Albion Steam Fishing, Co., Limited. The vessel will be fitted up with triple-expansion engines of 60 H.P. She was named the *Indian*.

Magoary.—On February 7th the twin-screw steamer *Magoary* was launched from the yard of the Dundee Shipbuilders Company, Limited. The vessel has been built to the order of Brazil owners, and is 150 ft. long, 24 ft. broad, 10 ft. 11 in. deep, and 156 tons net register. In order to keep the air pure in the holds, Blackman electric fans have been fitted up. The *Magoary* was towed to Camperdown Dock, where she is to be fitted out for engaging in the cattle trade on the Amazon.

Guiding Star.—On February 8th there was launched by Messrs. John Duthie & Co., at Aberdeen, a steam trawler, 110 ft. long, 20 ft. broad, and 10 ft. 8 in. deep, for Mr. Thomas Walker, Aberdeen. She will be fitted with compound engines of 50 h.p. by Messrs. Lewis & Son, Aberdeen. She was christened the *Guiding Star* by Mrs. Mack, wife of the captain.

Lancashire.—On February 8th there was launched from the yard of Messrs. John Scott & Co., Kinghorn, a steel twin-screw ferry passenger steamer for the cross-river service of the Mersey, built to the order of the Birkenhead Corporation, and to the 100 A1 class British Lloyd's. Her dimensions are 158 ft. by 42 ft. by 12 ft. 6 in. moulded, 574 tons register, and has a carrying capacity for 1,694 passengers.

Mercedes.—On February 9th there was launched by Messrs. Mackie & Thomson at Govan, the steam trawler *Mercedes*, which they have built for Mr. Cesar de Groote, Ostend. The dimensions of the vessel are:—Length, 116 ft. 9 in.; breadth, 21 ft. 6 in.; depth, 12 ft.; and tonnage, 200 gross. Triple-expansion engines of 450 I.H.P. will be supplied by Messrs. Ross & Duncan, Govan. Mrs. R. H. B. Thomson launched and named the vessel.

Arabian.—On February 10th there was launched at Aberdeen for the Albion Steam Fishing Company, Grimsby, a steel ketch rigged steamer of about 184 tons gross, named the Arabian.

Ben Alder.—On February 11th there was launched at Aberdeen for the Aberdeen Steam Fishing Company, Aberdeen, a steel ketch-rigged steamer, of about 153 tons gross, named the *Ben Alder*.

Gertrude.—On February 11th there was launched by Messrs. Scott & Sons from their yard at Bowling a screw-steamer of the following dimensions:—142 ft. by 25 ft. by 12 ft. moulded. She has been built to the order of Messrs. Joseph Monks & Co. (Limited), Warrington. Compound surface-condensing engines are to be fitted by Messrs. Ross and Duncan, Whitefield Works, Govan. On moving down the ways the steamer was named *Gertrude* by Mrs. Howard, Kendrick-street, Warrington.

Shemara.—On Saturday, February 11th, Messrs. Ramage & Ferguson, Limited, Leith, launched from their building yard a steel screw steam yacht of about 600 tons, built to the order of Messrs. A. R. and J. M. Sladen, Cleeve Howe, Windermere, from the designs of Messrs. Cox & King, London. On leaving the ways, the yacht was named *Shemara* by Mrs. A. G. Ramage, which name means "Fairy of the Sea." The dimensions of the *Shemara* are: length, L.W.L., 177 ft. 3 in., length for tonnage, 187 ft., breadth, 26 ft., depth moulded, 16 ft. The power for this vessel is supplied by triple expansion engines with cylinders 16 in., 26 in., and 42 in. diameter, by 27 in. stroke, and steam is supplied from two boilers of large diameter, working at a pressure of 160 lbs. The yacht has also a full installation of electric light, projector, &c., and all the fittings throughout the ship are of the best possible description. We may add that this yacht, as well as the previous one built by Messrs. Ramage & Ferguson, Limited, about 18 months ago, for the same owners, marks a new departure in yachting, in that the dining, drawing, and smoking rooms are all on the main deck, with intercommunication between each. These apartments are very luxuriously fitted up, and the *Shemara*, when completed in about two months' time, will doubtless prove a valuable addition to the yachting fleet, and reflect great credit on the designers and builders. After the conclusion of the naming ceremony, Mrs. A. G. Ramage was presented with a handsome silver casket, as a momento of the occasion.

Saltees.—On February 14th there was launched from the yard of the Caledon Shipbuilding and Engineering Company (Limited), at Dundee, a finely-modelled steel screw-steamer, built to the order of the Clyde Shipping Company (Limited), Glasgow. The vessel is 260 ft. long, 35 ft. broad, and 17 ft. 3½ in. deep, her gross tonnage being 1,250. The vessel was named *Saltees*.

Windsor Castle.—On February 14th there was launched from the yard at Govan lately occupied by Messrs. Donaldson, Aitken & Scott the iron screw-trawler *Windsor Castle*, built for Mr. J. A. Smith, fish merchant, Hull. The vessel, along with others, was contracted for by Messrs. Donaldson, Aitken & Scott, and the work is now being finished by Messrs. Cochrane & Cooper, of Beverley, on behalf of Mr. J. A. Smith, Mr. M'Gill, late manager of the Ardrossan Shipbuilding Company, superintending the operations. The *Windsor Castle* is 115 ft. in length, 21 ft. broad, and 11 ft. 3 in. deep. She will be registered 100 A1 at Lloyd's, and will have triple expansion engines, by Messrs. Shanks, Anderson & Company, Pollokshaw

Forth and Greta.—On February 15th the Irvine Shipbuilding and Engineering Company, Limited, Irvine, launched two screw steam trawlers. The vessels are built of steel to Lloyd's highest class under special survey, and are fitted with the most modern appliances for their work in the North Sea. They are of the following dimensions: 105 ft. B.P. by 21 ft., by 11 ft. 6 in. moulded, and are being supplied by Messrs. Muir & Houston Limited, Glasgow, with triple-expansion engines of about 250 I.H.P., having cylinders 10 in. 16 in., and 27 in. by 20 in. stroke, steam being supplied by a large steel boiler working at 180lb. pressure. The vessels were named *Forth* by Miss Marion Hetherington, and *Greta* by Mrs. Wishart, of Glasgow.

Lucculite.—On February 20th Messrs. Ross and Marshall launched at Greenock a steam lighter of 120 tons, named the *Lucculite*, which they have built and engined for their general coasting trade.

LAUNCH.—GERMAN.

Gertrud.—On January 21st, the s.s. *Gertrud* was launched from the yard of the Flensburg Shipbuilding Co. She is a vessel of about 800 tons gross register, built to German Lloyd's class, and has dimensions 208 ft. by 29 ft. by 14 ft. 1 in. depth, moulded. The owners are Neue Dampfer Compagnie in Stettin, and the ceremony of naming the vessel *Gertrud* was gracefully performed by Miss Gertrud Schröder.

TRIAL TRIPS.

Moravian.—On January 20th the new steamer *Moravian*, which has been built and engined by Messrs. Robert Napier & Sons, Govan, for Messrs. George Thomson's service between London and Australia (of which we gave full particulars in our Launch columns, November issue, page 332), went down the Clyde on her official trial trip. The engines, which have been supplied by the builders, are of 3,700 indicated horse-power, and are on the triple expansion principle, with cylinders 30 in., 50 in., and 80 in. in diameter by 54 in. stroke. Steam will be supplied by two double-ended boilers, with a working pressure of 200 lb. Several runs were made on the measured mile, and these were most satisfactory, the mean speed arrived at being 15¼ knots, while 14¾ only was guaranteed.

Thyra.—On January 21st the steamer *Thyra*, built by Messrs Osbourne, Graham & Co., at Hylton, near Sunderland (of which we gave particulars in our Launch columns, January issue, page 428), was taken to sea for her official trial trip, which proved in every way satisfactory.

Sirdar.—On January 24th, the s.s. *Sirdar*, built by Messrs. The Tyne Iron Shipbuilding Co., Limited, for Messrs. The Red "R" Steamship Co., Limited, of Newcastle-on-Tyne, went to sea for her trial trip. This vessel, which is a handsome specimen of the modern cargo steamer, has been specially designed for carrying large and bulky cargoes on light draught, and is also specially arranged and fitted up for the carrying of grain, and is complete with direct-acting steam windlass with quick-warping gear, 5 powerful steam winches, large multitubular donkey boiler, Scott's steam steering gear amidships, Hastie's left and right handed screw gear aft. The machinery which has been supplied by Messrs. The Wallsend Slipway and Engineering Company, Limited, worked very smoothly and gave every satisfaction, a speed of 11 knots being attained. The vessel was then put upon trial for her steering qualities and proved herself in this respect thoroughly satisfactory. The tanks under the boiler are fitted with the Patent Ventilating System of Mr. Landreth, the superintendent engineer for the owners. Among those present were representatives of the builders and engineers, together with the directors of the company and Messrs. Stephens & Sutton, of Stephens & Mawson, the managers for the owning company.

Prince Arthur.—On January 25th this vessel was taken to sea for her 300 knot trial. She has been built by Messrs. Earle's Shipbuilding and Engineering Co., Limited, of Hull, to the order of the Dominion Atlantic Railway Co., of Canada, under the superintendence of Messrs. Flannery, Baggallay, & Johnson, of London and Liverpool. Her dimensions are 290 ft. long, 38 ft. broad, and 17 ft. 8 in. moulded depth, and she is equipped as a first-class passenger and mail steamer. She has been constructed to Lloyd's A 1 shade deck coasting class and Board of Trade, and complies with the United States Government requirements for passenger service. Her service is almost entirely for express traffic, and handsome and extensive accommodation is provided for about 350 first class and about 60 second class passengers, including music saloon, smoke rooms, ladies rooms, &c., and all the modern conveniences for the comfort of the passengers. A strong room for carrying the mails is fitted on deck with bullion room built inside. The engines, which are twin screw, are of the following dimensions —cylinders 26 in., 40 in., and 2-45 in., with stroke 30 in., and are supplied with steam from four single-ended boilers of large capacity, having a working pressure of 180 lbs. per square inch, and fitted for force-draft on the closed stoke hole principle. The auxiliary machinery is very extensive, comprising steam windlass and winches, steam steering gear, ash ejectors, fire pump, Weir's pumps, centrifugal circulating pumps, &c., and for the purpose of driving the same a powerful donkey boiler of marine type has been fitted. The vessel has also a complete duplicate set of dynamos and engines, and is lighted and heated throughout by electricity, which is also used for driving both the ventilating and forced draught fans. On the trial the vessel and machinery behaved in a very satisfactory manner, and an average speed of 19·4 knots was attained, the machinery working without a hitch.

Varzin.—On January 26th, the new s.s. *Varzin* proceeded on her trial trip. She is built to the order of the Deutsche Australische Dampfschiffs Gesellschaft in Hamburg, by the Flensburg Shipbuilding Company. She is intended for the trade between Hamburg and Australia; has dimensions, 403 ft. 8 in. by 47 ft. 8 in. by 31 ft., depth moulded, and is built to Lloyd's 100 A1 as a spardeck boat with full poop and topgallant forecastle and accommodation in deckhouses on top of poopdeck amidships. Her carrying capacity is about 6,500 tons. The trial was very satisfactory, and the engines, of 2,500 H.P., also built by the Flensburg Shipbuilding Company, gave the vessel an average speed of 13 knots. After the trial the steamer went to Hamburg to take in a full cargo for Australia.

Kronborg.—On Friday, January 27th, the s.s. *Kronborg* was taken to sea for her trial trip. She is a large steel screw steamer built by Messrs. Wm. Gray & Co., Limited, to the order of Mr. C. K. Hansen, Copenhagen (of which we gave full particulars in our Launch columns, December issue, page 372). After adjustment of compasses, the vessel was headed to the north, the engines opened out to full speed and the log thrown overboard, when a speed of 12 knots was registered. After a most satisfactory run Sunderland was reached, at which port the *Kronborg* takes in her first cargo.

Greenwich.—On Thursday, February 2nd, the s.s. *Greenwich*, built by Messrs. Ropner & Son, of Stockton-on-Tees, to the order of the Britain Steamship Company, London (of which we gave full particulars in our Launch columns, February issue, page 475), made her trial trip in the Tees Bay, which was quite satisfactory in every way, despite the strong sea which the vessel had to contend with. The owners were represented by Mr. James Spence, under whose supervision the steamer had been built, whilst the builders were represented by Mr. Leonard Ropner. After adjustment of compasses, the steamer proceeded on her run round to Cardiff, where she will load for Brazil.

Folmina.—On February 3rd the screw-steamer *Folmina*, which has been built by Messrs. John Priestman & Co., Southwick (full particulars of which we gave in our Launch columns, January issue, page 427), left the Wear for her official trial, which was in every way a success, the engines throughout working smoothly and without a hitch. A speed of twelve knots was easily maintained, this being considered highly satisfactory. During construction the vessel and engines have been under the supervision of Mr. G. H. Strong, M.I.N.A., of Hull. After the trial the vessel, under the command of Captain Van Eyken, proceeded in ballast on her voyage to Port Arthur, Texas (U.S.A.)

Normanton.—On February 8th the steamer *Normanton*, built by Messrs. A. Rodger & Co., Port Glasgow, and engined by Messrs. Hall, Brown, Buttery & Co., Govan, for Messrs. M'Laren & M'Laren, of Glasgow, underwent a satisfactory trial on the Clyde, and afterwards proceeded to Genoa with a full cargo of coal.

Castilian.—On February 9th the new steel screw steamer *Castilian* built to the order of the Allan Line Steamship Co., Limited, Glasgow, by Messrs. Workman, Clark & Co., Limited, Belfast (of which we gave full particulars in our Launch columns, November issue, page 334), had her trial trip on the Clyde. A party representing the owners and builders was conveyed from St. Enoch's Station, Glasgow, by a special train to Greenock, where they embarked on board; after an enjoyable cruise the vessel was tried on the measured mile, an average speed of 15 knots being attained. The party was then taken back to Princes Pier by the tug in attendance, and reconveyed by special train to Glasgow. After the trial the *Castilian* proceeded to Liverpool to take her position in the regular service between Liverpool and Montreal. The *Castilian* is the first of three new passenger steamers now building for the Allan Line service between Liverpool and Canada. These steamers are specially designed to meet the modern requirements of the Canadian trade. They are to combine with high speed, great cargo carrying capacity, and the highest class of passenger accommodation. Although in speed these vessels are not intended to come up to the fastest of the modern Atlantic greyhounds, they will claim, we are told, to rival them in the character of their passenger accommodation; and the shorter mileage of the voyage to Canada will enable their passages, when measured by time, to compare favourably with those of the higher speeded vessels traversing longer routes. While the two steamers which are to follow the *Castilian* will be of larger size and greater speed, and fitted for increased number of passengers, the *Castilian* will be unsurpassed in the comfort of her accommodation for all classes. The propelling machinery consists of one set of triple expansion surface condensing engines with three cylinders on three cranks, and to work at a steam pressure of 200 lbs. per square inch. The propeller is of bronze, and the shafting of extra large size. Independent engines are fitted for feeding the boilers and circulating the water in the condensers, large evaporators and feedheaters fitted, also all modern improvements for the Atlantic passenger service introduced. Steam is supplied by three large double-ended boilers and one single-ended boiler, all fitted with Howden's system of forced draught. In accordance with the usual practice of the Allan Line, special attention has been given to arrangements for ensuring the accuracy of the compasses, and to the provision of all the equipment required for safe navigation of Canadian waters. The *Castilian* may be expected to become a favourite steamer in the Canadian trade during the coming season.

Almora.—On February 11th the large cargo steamer *Almora*, which has just been completed for Messrs. MacLay & MacIntyre, Glasgow, by Messrs. D. & W. Henderson & Co., Partick (of which we gave full particulars in our Launch columns February issue, page 477), ran her trial trip. The vessel is 4,385 tons gross. During the day the machinery worked without any hitch, and gave every satisfaction to the owners and their representatives, who were on board. A speed of 11 knots was easily obtained, which was considered most satisfactory. After the trial trip the vessel left for Cardiff, where she will complete loading for the East Coast of Africa.

Afghanistan.—On February 11th the s.s. *Afghanistan*, launched from the yard of Messrs. Short Brothers (of which we gave full particulars in our Launch columns, February issue, page 474), went out on trial trip. After compasses were adjusted a series of runs was made over the measured mile, with a result of 12 knots. After the trip the vessel proceeded to Cardiff to load for the Plate, under the command of Captain Whitlock.

Craigleith.—On February 16th the large steel screw steamer *Craigleith* was taken to sea for her trial trip. She has been built by Messrs. Wm. Gray & Co., Ltd., West Hartlepool, and is the latest addition to the Craig Line of steamers (Messrs. Russell and Huskie, of Leith). She takes Lloyd's highest class, and is of the following dimensions: Length over all, 341 ft.; breadth, 47 ft.; depth, 27 ft. 4 in. Her deck erections consist of poop, long bridge and forecastle. The saloon, state rooms, captain's, officers, and engineers' accommodation is in large deck houses on the bridge, and the crew's berths are in the forecastle. The hull is built with deep frames, large hatchways are fitted, six steam winches, steam steering gear amidships, and hand screw gear aft, patent direct steam windlass, patent donkey boiler, cellular double bottom for water ballast, shifting boards throughout, stockless anchors, telescopic masts with fore and aft rig, boats on beams overhead, and all requirements for a first-class cargo steamer. Triple expansion engines have been supplied by the Central Marine Engine Works of Wm. Gray & Co., Limited, having cylinders 25 in., 40 in., and 65 in. in diameter, with a piston stroke of 42 in., steam being generated in two large steel boilers working at a pressure of 160 lbs. per square inch. The vessel and her machinery have been completed under the personal supervision of Mr. Huskie, and this gentleman, together with Captain Murrell and Mr. W. C. Borrowman (the two latter gentlemen representing the Shipyard and Engine Works respectively, were on board to witness the trial. Everything in the engine room went exceedingly well, and to the entire satisfaction of those on board, there being no water applied to any bearing whatever, and the engines running so smoothly as not to be heard on deck; the boilers kept up an ample head of steam, and remained perfectly tight. On the conclusion of the trial the *Craigleith* at once proceeded to Cardiff, her loading port, whence she proceeds to Colombo.

Stanfield.—On February 18th this vessel was successfully tried at sea and gave most satisfactory results, the owners and their representatives being well pleased with the performance of the ship, which gave a mean speed of about 11 knots. She has been built by Messrs. Joseph L. Thompson & Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, to the order of Messrs. Joseph Brown & Son, Liverpool, and is the sixth vessel constructed by this firm for these owners. The principal dimensions of the vessel are:—Length, 343 ft.; beam, 48 ft.; depth, 27 ft. She is built to Lloyd's highest class, under their special survey, on the three deck rules, with one deck laid, the holds being left clear for cargo. She has a poop and bridge also left clear for cargo. The whole of the accommodation captain, officers, engineers, mess-rooms, saloon, &c., being in houses on top of the bridge deck. There is a large chart and, steering house placed on top of the saloon house. The crew, firemen, and petty officers are berthed in the topgallant forecastle. The vessel is rigged as a two-masted fore and aft schooner, and is fitted with all the most modern appliances for the rapid handling of cargo. There are five powerful steam winches at the hatchways. A patent steam windlass on the forecastle head. A steam steering gear is placed at the after end of the engine casings, being connected by controlling gear to the forward bridge, and a powerful screw gear is placed on top of the poop deck aft. The deck machinery is supplied with steam by a large donkey boiler placed in the engine and boiler casings. The vessel has a cellular double bottom right fore and aft, constructed to carry water ballast, which will also be carried in the after peak. She is built on the deep frame principle, and has six watertight bulkheads. Shifting boards divide the holds right fore and aft. The vessel generally, is a perfect type of the modern cargo carrier, having a deadweight capacity of about 5,800 tons on a moderate draught of water. She will also carry a very large measurement cargo. The engines and boilers have been constructed by Messrs. John Dickinson & Sons, Limited, of Sunderland, the sizes of the cylinders being 24 in., 40 in., 65 in. by 42 in. stroke, supplied with steam by two large multitubular boilers working at 160 lbs. pressure. The machinery ran very smoothly during the trial, and gave complete satisfaction to the owners. There was a numerous company on board, including representatives of the builders and engineers, and also including Captain Joseph Brown, head of the firm of Messrs. Joseph Brown & Sons, the managing owners, and Captain Fleming, who will take command.

Correspondence.

[It must be understood that, in giving insertion to communications under this heading, we do not in any way pledge ourselves to the opinions preferred therein. We will with pleasure insert any letters likely to benefit our readers, either from their intrinsic value or as being calculated to promote such discussion as will elicit facts valuable from their being the result of practical experience.—Ed. M. E.]

SYSTEM OF BALANCING ENGINES.

To the Editor of the Marine Engineer.

Sir,—I hereby enclose to you the P.O. Order for the sum of 7s. 6d., and wish you to renew my subscription for 1899, I find your paper very useful to me, as I found some articles worth studying in it, particularly those discussions on the propeller shafts by the Institute of Marine Engineers, and also the water-tube boiler question. We here on the fresh water lakes do not fancy them; as yet we have just a few in use, and it has hardly been demonstrated what they will do. Two boats that I have heard of each contain twenty-eight Belleville water-tube boilers, and I understand they each carry a special gang of men who are constantly engaged, replacing burnt out elements and otherwise repairing the boilers, so what few we have here, so far, cannot be considered a success. There is one thing I would like very much to see explained and described in your paper, that is, the Yarrow, Schlick, & Tweedy system of balancing engines.

I remain yours, etc.,
Jas. A. Findlay.

Toronto, Ontario, Canada.
Jan. 13th, 1899.

[We propose giving an illustrated description of the Yarrow, Schlick, & Tweedy system of balancing engines in our next.—Ed., M.E.]

THE NEW STEAMER "DEUTSCHLAND."

To the Editor of The Marine Engineer.

Dear Sir,—As I have been a subscriber to your journal for quite a number of years, I trust you will permit me to call your attention to a notice which appeared in your number of December 1st, headed "The Times," on page 346. I wish to point out to you that the new steamer *Deutschland*, of the Hamburg-American Line, will be 45 ft. longer than the *Kaiser Wilhelm der Grosse*, and whether the *Deutschland* will be inferior in size to the *Oceanic* is an open question. It seems to me that your notice is somewhat severe upon our Line.

I had the pleasure of making the acquaintance of one of your representatives, who was our guest on one of our steamers in 1893, when he visited the World's Fair. At the time I appreciated very much the expression of his good-will.

Yours very truly,
Emil L. Boas,
General Manager,
Hamburg-American Line.

New York,
Dec. 19th, 1898.

NEW SHIPBUILDING CO. AT BLYTH.

To the Editor of The Marine Engineer.

Dear Sir,—I see in your paper, Marine Engineer for February, you state there is a new shipbuilding company about to start at Blyth. I don't know if this applies to us or not, but we should be glad if you can see your way clear to put in the Blyth Notes that we have taken over Messrs. Saunderson & Co.'s premises, and are open to do ship repairs and engineering in all its branches.

We may state we shall recommend your paper as the best going for shipowners, shipbuilders, engineers, and sea-going men generally.

In anticipation of receiving this favour from you,

We are,
Yours faithfully,
Modlin & Light.

Blyth & Tyne Engine Works,
Blyth, Northumberland,
Feb. 10th, 1899.

Reviews.

L'Aide-Memoire de l'Officer de Marine. Paris: Charles Lavauzelle, 1899.

The twelfth issue of this invaluable publication seems to be worthy of its predecessors. It should be in the hands of every one who is interested in the growth and comparative strength of the armaments of the Naval Powers. For Frenchmen it has, of course, certain peculiar features of interest, such as its Navy List. It has also its usual tables of submarine cables—which are certainly of great interest from a military point of view—and an excellent resume of the law of nations as affecting belligerents. As is to be expected in publications of this nature, however, the figures afforded and vessels included are open to considerable comment. We are told in the preface that vessels built more than twenty years ago, and those that have insufficient protection or armament, being valueless from a fighting point of view, have been eliminated from the tables. Yet in the list of British ships we have the old *Black Prince*, *Achilles*, *Agincourt*, *Minotaur*, *Northumberland*, *Shannon*, *Nelson*, and *Northampton*. These vessels are, it is true, "starred" as of no present worth from a fighting point of view, but they still appear and have their armaments still, although some of them at least are quite dismantled and the remainder ought to be. We may, after this little indication as to their value, quote the figures appended:—

	England.	France.	Russia.
Armoured ships	83	57	55
Unarmoured ships	334	122	61
Torpedo vessels	156	242	189
Officers	3,790	2,305	1,527
Men	66,828	41,150	38,000

If the figures are reliable Great Britain by no means shows that superiority to the most powerful possible combination of two navies, which our authorities have accepted as our minimum standard of strength.

Text Book of Theoretical Naval Architecture. By E. L. Attwood. London: Longman, Green & Co., 1899.

This well printed volume has been written by one of the assistant contractors to the Royal Navy, with the aim of assisting students to instruct themselves in this most important and difficult branch of their course in qualifying themselves for the examinations of the Science and Art Department. A vast number of problems that must be reckoned with as well in the work of the naval architect and the draughtsman as in the examination room are examined and explained and elucidated by clear and concise definitions of the various terms employed, and by a large number of well-devised diagrams. The writer appears to have fully and thoroughly covered the ground of the extensive subject he treats, and to have brought together for the use of his readers the latest knowledge of a very intricate branch of knowledge. The book can be cordially recommended to all young draughtsmen in shipbuilders' offices.

Recent applications for Patents connected with Marine Engineering, Ship Construction and Mechanical Appliances for use in Ships, from January 11th to February 7th, 1899.

713 J. W. Branston. Cutting holes in boiler plates.
723 J. Carmadine, jun. Detecting pressure in boilers.
737 T. R. Marsden and Platt Bros. & Co., Limited. Engines.
739 F. Woollons. Frame for bunkers.
741 J. S. Helyer. Under-water line water closet.
757 J. Farnsworth. Paddle-wheel for propelling ships.
758 J. Farnsworth. Creating force by water.
778 A. Craig. Internal combustion engines.
802 F. G. Broughton. Preventing vessels sinking.
804 J. G. A. Donneley. Steam generators.
809 H. Carlisle. Piston rings and springs for same.
832 J. Mollison. Propeller shafts.
833 E., F., and W. Marsh. Centrifugal pumps.
857 S. Strickland & Co., Limited, and W. Cross. Water-tub steam generators.
865 D. Carter and C. J. Smith. Rotary engines.
867 P. A. Low & Williams & Robinson, Limited. Governing engines.
871 G. A. Nussbaum. Steam boilers.
878 E. P. F. G. Grant. Indicating courses of vessels at sea.
893 J. Green & J. Roberts. Steam generators.
905 J. Murrie. Showing the water level in boilers.
912 W. P. Thompson (P. Holmsen, Norway). Tubular boilers.
917 R. W. Jenkins. Maintaining a constant level on ships at sea.
951 J. Dawn & E. Bacon. Fender for ships.
969 J. M. Hurd. Water-tube steam generators.
987 A. J. Boult (G. C. St. John, United States). Boiler-tube cleaners.
999 T. & J. Broadbent. Nut locks.
1039 E. A. Wood. Protecting a ship's compass.
1072 T. H. Watson. Anti-fouling composition.
1133 E. Lagosse. Marine water-tube boilers.
1168 F. J. Warburton. Bearings for shafts.
1173 J. S. Binnie. Valves for steering apparatus.
1181 J. Masters. Smoke consumers for boilers.
1198 F. Blackith and J. Green. Metallic packings.
1203 V. de H. Dowler. Steering gear for ships.
1255 A. Knowles. Direct-acting steam pumps.
1259 J. Hewetson. Bridges for steam boilers.
1269 W. Fyall. Screw propulsion for vessels.
1274 M. Cassidy. Engineers' handy serving rod.
1318 H. G. and P. O. Riemer. Raising sunken ships.
1347 T., H., and W. Walker. Steam boilers.
1353 A. J. Boult. (L. Cailleaud, France.) Boats.
1365 J. S. Monro. Engine revolution indicators.
1383 T. J. Jacombs. Steam boiler furnaces.
1415 A. E. Nilsson. Raising sunken vessels, &c.
1424 R. T. Preston, (W. H. Martin, Holland.) Screw propellers.
1435 G. A. Nussbaum. Flue tubes for steam generators.
1495 W. Craig. Welding of boiler plates.
1498 D. A. Quiggin. Feeding and brining pump.
1499 R. Scaife. Radial drilling machines.
1500 J. Marshall. Course signalling at sea.
1545 H. Kirkham. Governing the cooling surface in condensers

1601 J. Butterworth. Steam traps.
1604 T. E. Jones. Rotary cylinders.
1616 H. B. Barlow. (J. Moore, Victoria.) Centrifugal pump.
1632 E. J. Clubbe and A. W. Southey. Steam generator.
1652 H. H. Lake. (T. Zaruba & Co., Germany.) Lubricators.
1665 H. Weeren. Adjustable valve for steam.
1677 G. Lewis. Propulsion of ships and boats.
1711 J. H. Hamilton. Internal combustion engines.
1720. G. Shaw. Locking Nuts.
1724. J. J., T. F., and J. W. Meldrum, and F. Clayton. Mechanical stokers.
1727. J. G. A. Kitchen. Steam generators.
1728. J. W. Nasmith. Steam traps.
1771. A. J. Van Stockum. Gear for torpedoes.
1776. J. I. Thornycroft and Co. Water-tube boilers.
1786. E. Boyes. Boilers.
1812. C. Butlin. Apparatus for raising wrecks, &c.
1814. S. E. Alley and D. Mathieson. Heating feed-water.
1822. H. B. and J. S. Watson. Water-gauge fittings.
1825. G. Ernst. Cylindrical surface gauges.
1873. W. C. Hart. Anchor Watch.
1874. H. Lentz. Automatic boiler-feed device.
1875 H. Lentz. Steam engines.
1877 L. E. O. de Visser. Preventing boiler incrustation.
1890 A. H. Gosling. Bearings for journals.
1936 E. Wolfgang. Stand to sustain boats.
1937 E. Wolfgang. Self-releasing hook for boats.
1962 R. A. Meyer. Steam boilers.
1985 G. Hepburn, J. Taylor, & D. H. Evans. Engine governors.
2012 A. Lutze. Lubricators.
2041 W. Thompson. Lubricator for crank pins.
2052 W. Reid. Steam pumps.
2077 F. Turner. Distributing oil on rough waters.
2087 F. A. Pape. Hanging boats' rudders.
2093 M. Bouchet. Navigable vessels.
2108 S. Makaroff. Preventing damage to vessels.
2124 J. Menzies. Check-feed hydraulic pump.
2160 W. Youel. Valve mechanism for condensers.
2161 H. H. Lake (A. P. Kinney & E. Vaughan, United States). Engine indicators.
2209 F. G. Lundwall. Centrifugal pumps.
2225 C. Mackeprang. Hook for boat-detaching apparatus.
2264 W. E. Pott. Water level indicators, &c.
2265 E. C. F. Otto and E. C. F. Otto, jun. Screw propellers.
2321 W. Weir and J. R. Richmond. Steam pumps.
2329 J. McL. Ford. Armour gratings for use in warships.
2352 H. M. Rumble. Compound steam engines,
2354 R. Shapland. Propelling ships.
2355 R. Shapland. Propelling ships.
2356 E. J. Lane. Rotary pumps.
2359 E. H. Cheesewright. Steam boilers.
2383 G. Fisher and G. Weir. Lubricators.
2387 G. Russo. Ascertaining the behaviour of ships.
2411 W. M. Binny. Purifiers for feed water.
2412 W. M. Binny. Boiler and heater scale trap.
2427 R. Richardson. Controlling steering gear.
2444 J. J. Shiers and H. Howe. Steam boilers.
2522 J. J. and T. L. Galloway. Steamship ejectors.
2534 J. Davidson and T. R. Hampson. Steam engines.
2556 H. Porter and T. E. Halford. Steam boilers.
2584 D. B. Morison. Feed-water heaters.
585 W. Whyte and J. M. Robson. Metallic packing.
2640 W. O. Moore. (Pocklington, Natal.) Steering vessels.
2646 T. Hughes. Boiler alarm for high steam.
2684 S. Skon. Avoiding danger to ships in collision.
2692 C. T. Crowdon. Internal combustion engines.
2711 W. D. Litchfield. Torpedo-controlling devices.
2722 J. Rowan. Netting racks for ships' cabins.
2770 H. Burrell. Construction of cargo steamers.
2779 D T. Rounsivell. Travelling crane.

Messrs. Bell, Thompson & Co., 32, Irwell Chambers, East, Fazakerley Street, Liverpool, inform us that they have been appointed agents for Flockton, Tompkin & Co., Limited, Sheffield, manufacturers of every description of tool steel as used by engineers, shipbuilders, miners, and kindred trades, also solid steel hammers, files, and other tools.

BOARD OF TRADE EXAMINATIONS.

NOTE.—1C denotes First Class; 2C Second Class.

January 28th, 1899.		
Bacon, Walter..	2C	Hull
Beattie, Geo. W.	2C	Sunderl'd
Chick, Albert ..	2C	Liverpool
Clarke, Ernest J.	2C	Hull
Clarke, Harold..	1C	Liverpool
Cole, James E.	2C	London
Cruickshank, J.	1C	Aberdeen
Farquharson, W.	1C	Liverpool
Fergusson, W.	1C	London
Ferrett, Alfred	1C	Bristol
Forge, Fred	2C	Hull
Gollan, Donald	1C	Liverpool
Goudie, Gavin..	1C	N.Shields
Gray, Arthur ..	2C	London
Halffmann, J...	2C	„
Huntley, F. W.	2C	Sunderl'd
Kelly, Alfred E.	1C	„
Kidd, John	1C	Liverpool
Leary, John....	2C	Sunderl'd
Lewis, John W.	2C	Liverpool
Lundeby, P. C.	2C	London
Marks, Wm. V.	2C	L'nderry
Matthew, N. M'C	2C	London
M'Leod, Geo. D.	2C	„
Moreton, Ed. B.	2C	N.Shields
Morrison, Chas.	1C	Liverpool
Nicoll, Thomas	2C	Aberdeen
Owen, Owen J.	2C	Liverpool
Perry, C. S. D.	2C	Bristol
Richardson, W.	2C	Hull
Robinson, T. J.	1C	Sunderl'd
Robinson, W. J.	1C	„
Robson, W. H.	2C	Hull
Simpson, George	1C	Aberdeen
Smith, Bertie F.	1C	Liverpool
Stewart, John..	1C	Aberdeen
Thirkell, N.....	1C	Sunderl'd
Walker, Thos. J.	1C	Aberdeen
Webb, Robt. W.	2C	Liverpool
Wool, Chas. E.	2C	London
Young, Jas. E.	1C	Aberdeen
February 4th.		
Agnew, John ..	2C	Glasgow
Alexander, J. A.	2C	„
Arnott, J. E. ..	2C	Cardiff
Barrie, James..	2C	Glasgow
Blakely, B. W.	1C	London
Blyth, Wm.....	2C	Glasgow
Braidwood, T.	2C	Liverpool
Cruickshank, G.	1C	Glasgow
Defty, Robert R.	2C	N.Shields
Duffey, John ..	1C	Liverpool
Duncan, R. N.	1C	London
Ellis, Samuel ..	1C	Cardiff
Emerson, T. H.	2C	Glasgow
Hamilton, R. S.	2C	„
Hood, James ..	2C	„
Jones, Joseph E.	1C	London
Lamb, Charles	2C	Glasgow
Macaulay, Robt.	2C	„
Marsh, Percy C.	1C	„
Melville, Wm...	2C	„
M'Gregor, J. G.	2C	„
M'Gregor, W. D.	1C	„
M'Intosh, Geo.	2C	„
M'Isaac, John..	1C	Glasgow
Miller, James ..	1C	„
M'Millan, W. G.	1C	„
Morton, Geo. W.	2C	Liverpool
Orchard, O. P...	2C	Cardiff
Quayle, Wm...	2C	Liverpool
Rose, Fredk. E.	2C	London
Ross, Charles F.	1C	„
Scott, James ..	1C	Glasgow
Shephard, W. H.	1C	London
Thomas, B. C.	2C	Cardiff
Udall, Robert ..	1C	N.Shields
Vile, Edward ..	2C	Cardiff
February 11th.		
Ball, Robert ..	1C	Liverpool
Dawe, Fred G...	2C	London
Ewbank, John..	2C	N.Shields
Ford, Wm. J...	2C	London
Fulton, J. P. ..	2C	Liverpool
Grainge, J. R. W.	2C	London
Johnstone, A. E.	1C	„
Penman, R. G.	2C	Liverpool
Porter, Ernest..	1C	„
Sommerville, A.	1C	London
Steel, Walter ..	2C	Liverpool
Urpeth, T. A. ..	2C	N.Shields
Wilson, Ralph..	1C	„
February 18th.		
Aitken, Edward	2C	Greenock
Bailie, Hugh ..	1C	Liverpool
Bannermann, J.	2C	Greenock
Bennett, P. C...	1C	London
Boyd, John H.	2C	Greenock
Caldwell, W. ..	2C	Dublin
Campbell, J. ..	2C	„
Carmichael, A.	2C	N.Shields
Cook, Archibald	1C	Greenock
Crawford, Thos.	1C	„
Cummings, A.	2C	Dublin
Eadie, Jas. T...	2C	Leith
Garwood, F. B.	2C	London
Gaskin, Geo. H.	2C	„
Gillespie, James	1C	Greenock
Grice, Jas. W...	2C	Hull
Hibbert, Wm. E.	1C	N.Shields
James, John T.	1C	„
Jarvie, Walter..	1C	Greenock
Johnson, F. E.	1C	Liverpool
Johnston, J. T.	2C	Leith
Jones, Joseph H.	2C	Liverpool
Jones, Samuel S.	2C	„
Knowles, W. W.	2C	„
Liddell, Wm. B.	2C	Greenock
Lintott, Wm. R.	2C	Liverpool
Littlehailes, S.	2C	N.Shields
Lowthian, T. D.	2C	„
Marshall, J. L.	2C	„
Myers, J. N. ..	2C	Liverpool
Ogle, Samuel ..	1C	Dublin
Paterson, Wm...	1C	Greenock
Paulesen, J. C.	1C	„
Pirie, Geo.	2C	Leith
Sleight, John W.	1C	Hull
Torrie, Robert..	1C	London
Tuck, John	1C	Liverpool
Turnbull, John	1C	„
Vass, John	2C	Greenock

Incandescent Burners for Works Purposes.—We regret that one of the cuts (fig. 2), illustrating this article in our last issue, was inadvertently placed upside down, which no doubt our readers have already noticed.

FEB 5 1930